THE ENGINEERING AND MINING JOURNAL.

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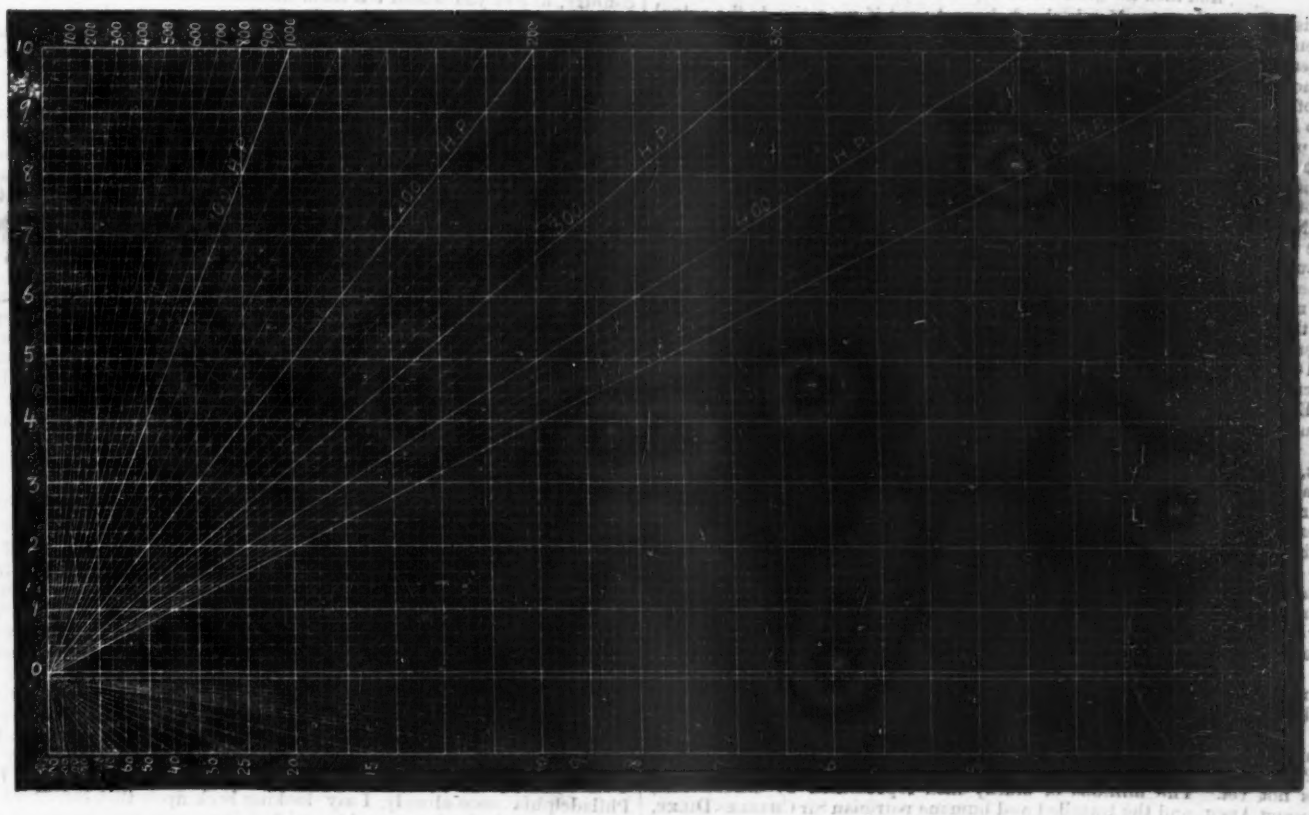
Water-Wheel Diagrams.

WE publish, this week, a scale showing the horse-power of streams which are estimated in "miners' inches," the hydraulic language of the west. The headings placed on the four sides of the scale, explain its use, almost without need of further elucidation. The diagonal lines represent horse-powers from 10 to 500. The horizontal lines represent miners' inches to one horse-power. By following the line of inches to the line of horse-power and then following the vertical line at the point of intersection, to the top, the number found there will be the number of inches. For instance in a case where 4 miners' inches give one horse-power, 300 horse-power will require 1,200 inches by the scale. In a case where the head or height of fall only is known and it is desired to ascertain the number of inches necessary for a given power, the result is formed by four operations. Take for instance 6 feet head and 200 horse-power. The line at the bottom, marked 6 feet, is followed until it intersects the diagonal of 500 horse-power, and the point of intersection is on the line 64 of miners' inches (right hand margin). Following this line to its intersection with the 200 horse-power diagonal and running the eye to the top, we find 1,280 is the marginal number. One thing more remains. The right hand margin has 10 times the value of the left hand, and the last result must be multiplied by 10, giving 12,800 inches, at 6 feet head for 200 horse-power.

MINERS' INCHES TO VARIOUS HORSE POWERS.



WATER-WHEEL DIAGRAMS.

The foundry at Perin, in Russia, is reported to have executed the largest casting for an anvil-block as yet made, the weight being 37,000 poods (equivalent to about 595 tons). This large casting is intended to receive the blows of one of the largest steam-hammers made,—50 tons—and the machine is constructed for the forging of steel guns of large calibre.

The American Institute of Mining Engineers.

THIRD ANNUAL MEETING, PHILADELPHIA, MAY 20, 1873.

ADDRESS OF HON. WM. D. KELLEY.

MR. PRESIDENT AND GENTLEMEN OF THE AMERICAN INSTITUTE OF MINING ENGINEERS: The agreeable duty of welcoming you to the city of homes and workshops on your assembling for the purpose of holding the third annual meeting of the Institute has been assigned to me, and in the name of her capitalists, of the skilled artisans employed in her vast and varied industries, and of her devotees to science, I bid you welcome to Philadelphia.

You will, I trust, find time during your stay in the city to visit some of our important workshops, and especially the large and well-appointed yards for the construction of sea-going iron steamers, which have come into existence, as if by magic, within the last three years. You will thus have an opportunity to see how largely we as a community are indebted to you and others who have faithfully pursued and applied the laws of mining, mechanical and civil engineering, and the cordial greetings you will receive from the proprietors of all such establishments and those to whom the superintendence of their several departments is confided, will convince you that my words of welcome are not formal, but sincere and earnest.

But for the forces of nature discovered and applied by scientists Philadelphia would be but an unimportant inland city, and the proportions of the commerce of New York would be relatively insignificant. The truth of this statement is not generally recognized. The masses of our countrymen do not yet perceive the relation of the truly scientific engineer and the metallurgist to the world's progress and their individual prosperity. Applied science is not yet included in the system of instruction provided by our Commonwealth for her children. It will be, and when that better day comes the annual meetings of your Institute will be greeted by ovations. Do not, I pray you, gentlemen, suspect me of exaggeration or extravagance of expression. Such is not my habit, and I do but use the language of truth and soberness when saying that to conscientious engineers and

metallurgists we must look for the commanders and leaders of the regenerating army of the future. You may boast that you are not politicians, but it is for you and your co-laborers, together with those who, from the current facts of history are patiently deducing a system of social science in harmony with natural laws, to regenerate society by harmonizing capital and labor, and bringing the seething anarchy which now prevails in this industrial world into subjection to law.

The world owes every man a living. This truth, though sadly perverted by blacklegs, thieves and vagrants, and though it is denied by every British teacher of political economy from MALTHUS to J. STUART MILL, is nevertheless a truth, the reasonableness and universality of which are to be demonstrated by the results attained by engineers, metallurgists, and their co-laborers in the pursuit and application of the laws which govern the forces of nature. Earnest men who have not been bewildered by the mazes and *ignes fatui* of a false and artificial science of political economy have ever believed that the Almighty had from the beginning provided ample sustenance for all his children. While yet analytical chemistry was unknown, and the five syllables, fire, air, earth, water, were supposed to enumerate and define the elements, GEORGE HERBERT quaintly said :

"More servants wait on man
Than he'll take notice of.
* * * * *
"He is all symmetry,
Full of proportions, one limb to another,
And to all the world besides.
* * * * *
"Nothing we see but means our good,
As our delight or as our treasure;
The whole is either our cupboard of food,
Or cabinet of pleasure."

And MILTON did but express the faith of the Commonwealth when he made the lady in "Comus" exclaim :

"Impostor, do not charge most innocent nature.
* * * * *
If every just man that now pines in want
Had but a moderate and beseeming share
Of that which lewdly pampered luxury
Now heaps upon some few with vast excess,
Nature's full blessings would be well dispens't
In unsuperfluous, even proportion,
And she no wit encumbered with her store,
And then the giver would be better thank't."

Nature is not a bankrupt. Nor is she dishonest; yet if we estimate the actual requirements of men by a standard no higher than the average consumption of the families of the laborers of the United States, we are compelled to admit that she does not pay each man what she owes him. No, destitution is the lot of the majority of the people even of Christendom. But you, engineers and metallurgists, who know how abundant and perennial are the supplies provided by nature, will not ascribe this widespread want to her, but to its true cause, the anarchy which prevails throughout the industrial world.

The famine that recently more than decimated Ireland was not attributable to the want of fertility in the soil or of great natural resources in the green isle of the sea. Nor was there a lack of provisions in British India when, more recently still, more than a million of the people of Orissa were swept off by famine; for we are assured by unquestioned authority that there are often 10,000,000 quarters of fine wheat rotting in the Punjaub alone for want of a market. Had the engineer and metallurgist been permitted to diversify the productions and employments of the people of British India, the miners, smelters, manufacturers, and transporters of Orissa could have paid the farmers of the Punjaub for their wheat, and saved Christian England from the double disgrace involved in this story. But national crimes like this do not escape Nemesis; and when, in 1870, Professor KIRK, of Edinburgh, wrote his admirable essays on the Social Politics of Great Britain and Ireland, he showed how terribly the woes of Ireland were being avenged. Said he: "The small farmer gives way to the mere ploughman; and capitalists, few in number, command the soil. The Irish farmers, with their families, are driven off from their farms, and come over to Scotland in shoals to press their labor on our capitalist farmers. They are fast taking the place of a Scotch peasantry, while these are driven into the towns or altogether off the country. Again, our Scotchmen are crowding in upon English labor and competing with that, both in the country and in the towns. The Irish are cheaper than the Scotch, and the Scotch are cheaper than the English; and, without knowing why, the working masses are being shoved off in thousands to save them from death."

In view of facts like these, may I not, while waving the question of its duty to the people of Ireland, who in 1840 numbered over eight millions and now but little over five millions, assert that the British government, had it allowed engineers and metallurgists to create in Ireland, as they could have done and will do some day, remunerative employment for the Irish people, would have maintained its own waning power by protecting the laborers of Scotland and England against this competition which is robbing life of all its joys, and many of them of life itself? Thus by its dereliction has that government fostered anarchy, and the end is not yet. The millions of sturdy men represented by BRADLAUGH, ODGER, JOSEPH ARCH, and the travelled and humane patrician Sir CHARLES DILKE, know that the world owes every man a living, and that if the engineer and metallurgist were permitted to apply nature's forces and cunning arts to the native resources of the British islands they would provide homes, food, raiment, and culture for every man and woman who may be born on those islands for centuries to come.

Subtle disquisitions in support of the theory that the Almighty failed to adjust the productive powers of nature to the law limiting the increase of population, and that it is therefore the duty of Government to perfect His work by providing by penal statute a preventative check upon the increase of population among the laboring classes, though sustained by MALTHUS, RICARDO, MCCULLOUGH, and MILL, will not satisfy the homeless people of England who are now numbered by the million or the rate-payers whose substance they are consuming. Nor will their sturdy champions accept this other dogma, no less impious, of the blind guides of the nation, that the Almighty, on discovering that He had not made provision for the sustenance of all His children, benignantly provided war, pestilence, and famine as the gentle angels by whom His oversight should be corrected. Having faith in His omnipotence and loving power, they contemn such blasphemy; and knowing that the world owes every man a living, will not, as KIRK has broadly intimated, forever consent to see their children die of want in order that game may be lawfully preserved, and deer may live to produce antlers with which to grace baronial halls.

But yours is the American Institute of Mining Engineers, and it is to the development of the resources of our broad and wonderfully-endowed country that you are devoting yourselves. The field is boundless as it is inviting. But, gentlemen, just here I find myself at fault. I am not able to speak to you on this point as you can to each other. Among professors of the exact sciences I am but a mute layman, without command, even, of the terminology with which to express the knowledge gathered while engaged in other fields of labor. You will, however, permit me to refer in plain ploughman's phraseology to a few prophecies of the great results you are to achieve. They are sufficient to show that your chosen field, of which no respectable geological recognizance has been made, affords ample room and verge enough for your emulation and enthusiasm. What may we not hope for the future when we remember that the marvellous development of the iron fields of the Marquette region is the work of less than fifteen years; that the iron industries of Indiana and Illinois have been created within a decade, and that the production of Bessemer steel employs many of the people of each of those States; that it is not twelve years since the attempt, often repeated, to produce merchantable steel at Pittsburgh became an assured success; that within two years we have ceased to depend on Oriental countries, in which it was found only in pockets at rare intervals, for corundum, a deposit of which has been found to crop out near our city limits, and which extends to the mountains of North Carolina, where a St. Louis company is working an apparently inexhaustible mine of this mineral, hitherto so rare and costly; and that France, Belgium, and Germany obtain from the banks of Platten Creek, Missouri, white sand, out of which they find it profitable to make plate glass for the use of the people of the Mississippi Valley. With these facts you are doubtless familiar, and they may have no special interest for you; but to us of Philadelphia they are pregnant with interest. Indeed, they, in part, account for the rapid growth of our city, as among those who are our rivals in some lines of business we find markets for many of our productions.

Who can estimate how much the want of competent engineers and metallurgists costs the American people annually? As I loitered one beautiful day on the road between Denver and Idaho Springs, this question ever and anon diverted my thoughts from the majestic scenes through which I was passing, for the road sides were marked by graves in which had been buried the unrequited labor of whole brigades of men, together with millions of capital which might have been saved had the inventors consulted a member of your Institute as to the probability of finding gold in any of those hills. It is thus in the vicinity of all the known gold-bearing regions of the country, but the loss is not limited to those regions. The mountains whose long shadows fall on Laramie Plains abound in coal and iron. The railroad passes through the valley, and you may every year find so-called practical men, who, hoping to find coal nearer the road than others have, spend whole summers in sinking shafts on the plains, from which, after a glance at the country, any of you would tell them the minerals had been washed ages ago.

What a field those mountains offer to the engineer! They are in themselves a vast empire, which is marked by distinguishing characteristics. The masses of the millions who will inhabit them will never engage in agriculture. They will be miners, for from the Mexican to the British line almost every range embosoms mineral deposits; others of them will gather vast herds and flocks of horses, cattle, and sheep, for the sustenance of which nature has made abounding provision; and others still, who, like the miners, will need your counsel and aid, will, by establishing smelting works, enable the miners to handle ores which are now wasted because they are not rich enough to repay the cost of transportation from the heart of the Rocky Mountains to Wales or Germany. At the eastern base of the mountains lies the American Punjaub, in which straw is burned as a nuisance, corn is consumed as fuel, and wheat is converted into pork because it will not pay the cost of transportation to the trans-Atlantic market for which it was raised.

Permit me, gentlemen, in conclusion, to inquire whether you cannot create a market for the productions of the farmers of these trans-Mississippi States by transferring under your enlightened superintendence a million or two of the sturdy laborers who now pine in want in foreign lands? The proposition is not chimerical, or, I should say, it ought not to be. Thus would you, by subjecting anarchy to law and bringing order out of chaos, demonstrate the right of the American Institute of Mining Engineers to command the conquering armies of the future.

THE PRESIDENT'S REPLY.

In reply to Judge KELLEY'S address of welcome, Mr. R. W. RAYMOND (President) said :—

In assuming the pleasant duty performed many times already, of replying on behalf of the Institute to the cordial words that have been spoken in welcome of our company, I am naturally led to a retrospect. It is two years ago to-day, speaking roughly, since the American Institute of Mining Engineers was founded. It owed its origin to three men, Messrs. ROTHWELL, COXE and CORYELL, (none of them very venerable patriarchs,) who signed the letter of invitation, on the strength of which our first meeting was held. The absence of two of these three ancestors from our gathering to-night, indicates that, so far as the health, strength and maturity of the infant are concerned, its parents consider it capable of going alone. Certainly, looking back upon the successful, vigorous and the not unfruitful career of the past two years, during which meetings have been held at Wilkesbarre, at Bethlehem, at Troy, at New York, at Pittsburgh, at Boston and at Philadelphia once already, I say looking back upon this career, and also upon the uncounted, the innumerable and the immeasurable benefits of a social, general and professional nature which have been conferred upon every one of us, upon the increase of activity in our profession, which is the result of a visible elevation of its *esprit de corps*, and looking forward to the promises that are spread before us in the near future, leading us with confidence to expect a wider sphere of activity and a more permanent and enduring influence upon the industries of the country—I say in view of all these things, we certainly may pronounce the American Institute of Mining Engineers at the end of its second year, not only to have cut its teeth but to be a mature adult, and that already, in a novel sense, the child has become father to the man; and the Institute, looking back upon those who gave it birth, calls them beloved sons.

Gentlemen, we ought to be penetrated with a sense of our own dignity and glory; if we are not so, it is not for the want of friendly voices to tell us of it, and it is certainly the triumph of the great grace of humility in us, if, after all the praise which has been so generally lavished on our profession by our friends, especially on occasions such as this, we still retain in any measure the consciousness that we are, after all, mortal, and these praises are apportioned more to our desires and hopes than to our deeds and deserts. Judge KELLEY has appointed us in advance "to lead the conquering armies of the future," and I can only say in regard to that, when we are nominated as leaders and generals, and our honorable friend has become the Senator from Pennsylvania, I trust his eloquence will secure the necessary ratification;—unless he should bethink him of the wise maxim: "The business of the engineer is to reconnoitre—and fall to the rear." But whether we are to command or whether we are to follow, it is sufficient for us to know that to that army of the future we certainly do belong—the army

which has hung out its victorious banners on the banks of the Thames, the Seine and the Danube, and which will spread them to the breeze in '76 on the banks of the Schuylkill—the army of skilled labor, the army of industry, art and science—the army of victorious peace.

Gentlemen, it is well known that, while we are not bound by any rigid laws, still, as a body, we do not deal with the questions of political economy as affected by legislation. The distinguished orator who has spoken to us to-night, has laid down a proposition more profoundly and permanently true than any system of political economy, in pointing out that the application of intelligence, of science, in short, to the productive industries of mankind is the greatest agency of civilization and progress. The world owes every man a living, was Judge KELLEY's remark. It is also true that the world is not bankrupt nor dishonest, but she is a hard paymaster. Nature is miserly, and the sort of coin she pays depends upon the cunning and persistence of her creditors. If we would let her off easily she would still pay in herbs, roots and scanty wild game, as she did aforetime, and does yet when she can find simple savage folk to receipt in full upon such wretched fare. Centuries of patient search it has cost us, to discover her secret hoards, and laying before her eyes the evidences of her wealth, shame her into more generous treatment.

Statesmen and politicians may devise and scheme on the surface; but beneath all lies the eternal fact that mankind receives from the earth no more than mankind is able to produce by labor. This product is the whole that is to be divided. It may be wrongfully divided; and wise men may busy themselves with correcting the errors of its distribution. But after they and their works shall have passed away, it will always appear that mightier than they and their measures were the silent colleagues who studied, not to revolutionize the distribution, but to augment the thing distributed. To increase the fruitfulness of labor is to improve the condition of the laborer.

Now the fruitfulness of labor is in direct proportion to its quality—or what we call skill, which is essentially an intellectual element. And this brings us to the heart of the truth: above and beyond all temporary, experimental, variable or political protection, education is the true protection of labor; science is the victorious inspiration of industry. This is the sphere in which we are called to work; and whatever we may accomplish here, be it little or much, will never be lost. Dynasties, administrations, and policies may have their day; currencies and tariffs may fluctuate; but to the end of time, the man or the nation that *knows how*, is master of the situation.

The relations of theory to practice, of science to the applications of science, have been discussed to an almost intolerable extent; the subject is, in certain aspects, threadbare, and it is well nigh impossible to present it in any light that will not reveal its worn and shiny seams. Yet I will venture one or two suggestions, connected more particularly with the professions which we represent, and calculated to meet the present circumstances of these professions in America.

Science is supposed by a great many people to be something that can be taken by itself, boxed upon the other side of the world, marked "right side up with care," shipped to us on this side and taken out as if it were an instrument ready for use. While there is nothing, however, in science that would justify such a supposition, it is nevertheless a fact that, like some instrument, it has been boxed up in that way, and having come to this side, cannot be used without adjustment for latitude, for temperature, for climate and for damage of the voyage.

In no other country is so much demanded of the mining engineer as in the United States. Abroad, the different labors connected with the production of the metals are divided. The problems of construction, excavation and transportation are dealt with by one class of experts; the mechanical preparation of ores may fall to the hands of another class; the metallurgical processes are studied and practiced by a third class. Seldom, at all events, are there less than two distinct departments, namely, mining and smelting, or, as the Germans say, *Bergbaukunde* and *Hüttenkunde*. With us, on the other hand, it often happens that the engineer must be manager of all departments and master of all trades. He is expected to officiate as geologist and mineralogist, and prophesy the value of the mine before it is opened; to lay out roads, erect buildings, conduct explorations, organize business, keep books, manage men, avoid or overcome litigation, select or construct machinery, execute underground surveys, draw maps, sort, dress, sample and assay ores, and superintend, if not actually perform, their reduction to metal; purchase supplies, sell products, enlighten directors and satisfy stockholders. He must be lawyer, financier, architect, surveyor, draughtsman, carpenter, mason, paymaster, blacksmith, geologist, civil engineer, mining engineer, mechanical engineer, chemist, metallurgist, author and orator, all at once. It need scarcely be said that this is expecting a great deal from one man, and that those who entertain the vague notion that what they call science will cover at once this wide field, are certain to be disappointed. It is not surprising that men, particularly young men, suddenly laid under such responsibilities, should prove deficient, in one or another point, and so bring loss upon their employers.

It is not any more for the benefit of the employer to throw such a miscellaneous burden upon the shoulders of any man, than it would be for them to carry on all kinds of agricultural labor with one kind of tool, or all kinds of mechanical labor with one kind of machine. Now there is no lack of willingness upon the part of young American Engineers to begin low down. Our young Engineers, so far as I know, are anxious all around to go straight to work and to set an example of industry, and not to attempt business administration in advance of business experience—to accept positions calculated to give them a business experience on the one hand, and an opportunity to practice their acquired scientific training on the other hand.

There is some difficulty in getting subordinate places for capable, intelligent, ambitious and industrious young men. The result is natural enough. The country is full of so-called practical men, a great many of whom know too well that their reign will be over, if intelligence strengthened by equal practice is put alongside of them; for when practice, intelligence, and good mental training go together, they will win in the long run.

Now one word in regard to the need of more earnest co-operation, and a more thorough attempt to create and consolidate among ourselves a national system of mining and metallurgy. I have remarked that there is much in the science of foreign countries that does not fit the conditions of this country, and it would be surprising if it did; for if our science does not fit them, why should theirs fit us?

Theory expresses itself in formulas. These always contain an empirical element. What is its significance? It means that, after taking into our calculation all the ascertainable conditions, there are others which cannot be accurately measured, or even enumerated. The chemical formula, as obtained in the laboratory, is not applicable without alteration at the furnace—not because chemistry is not as true on the large as on the small scale, but because we cannot obtain all the conditions on the small scale which the larger operation presents or requires. Without undervaluing the importance of the laboratory—without which, indeed, not a single step of progress in metallurgy is possible—let me say that every man in charge of a furnace has a laboratory before him, in which he ought to study processes and record results. This will give us the only true basis for a thorough art of American metallurgy.

In these practical industries, as much as in general science, theory is valuable in proportion as it is an induction from sufficient data. Take as an illustration the question of the efficacy of a steam engine. You know what extraordinary figures have been reached abroad by the Cornish engines—obtained by *multiplication*—from short and minute trials. The method is absurd for any practical test. The true result can only be obtained by *division*—from long-continued regular working.

But the theory of the steam engine should include economy as well as efficiency. Indeed, economy is a part of efficiency. After we have determined the number of pounds of water evaporated with a pound of coal, and the number of foot-pounds of force generated by the use of this steam, the questions of initial cost, attendance and repairs are still before us—and they are part of the problem. What; can money be included as a part of the fuel consumed? Certainly; money is accumulated labor; money is foot-pounds; money is correlated with every form of force. It may be turned into heat, motion, light—you can at any time (if our friend Mr. GOWEN will permit) buy coal with it.

Here, for instance, is a pumping engine costing $100,000 and capable of extraordinary high "duty," and here is another engine costing $3,000, but of lower efficiency. The question of selecting the one or the other in any case is simply solved by calculating the amount of interest on the difference in original cost. With us, this interest will generally more than buy the greater amount of coal required by the smaller engine.

This consideration, gentlemen, vitiates all the formulas of European books, with regard to machines and processes. We can learn from abroad the method of testing; but we must make our own tests. Science is a method of inquiry, not a body of facts merely.

We print, in advance of the regular report, the list of new members and the new rules which were adopted, after considerable discussion, these being matters of business which are distinct from the professional discussion of engineering subjects, which fills up the greater part of the Institute's meetings.

The following is a complete list of the new Members and Associates elected at this meeting.

M. WM. EARNEST FLEMMING, Pioche, Nevada.
M. E. F. LOISEAU, Mauch Chunk, Pa.
M. F. A. FISHER, Bristol, Tenn.
M. D. VAN LENNEP, Unionville, Nevada.
M. W. N. SYMINGTON, Brooklyn, N. Y.
M. WM. HILLEBRENT, Salt Lake City, Utah.
M. O. H. CRUSIUS, Columbus, Ohio.
M. GEO. ED. HARDING, 52 Broadway, New York.
M. J. LEONARD JERNEGAN, Drifton, Pa,
M. ISAAC ISELIN, Salt Lake City, Utah.
M. E. B. HARDEN, Philadelphia.
A. GEORGE L. HUGGINS, Easton, Pa.
A. T. M. LOGAN, Richmond, Va.
A. H. HAUPT, Jr., 3206 Chestnut St., Philadelphia.
A. J. HARTSHORNE, 1439 Walnut St., Philadelphia.
A. ROBERT P. FIELD, 124 S. Front St., Philadelphia.
M. Prof. G. F. BARKER, Philadelphia.
A. EDWARD NICHOL, Troy, N. Y.
M. JOHN J. CRAWFORD, 1326 Vine St., Philadelphia.
A THEODORE HOYT DEBBLE, Pottsville, Pa.
A. S. M. PITTMAN, Somerville, Mass.
A. JOHN F. CHALFANT, SPANG, CHALFANT, & Co., Pittsburgh, Pa.
A. AUGUSTUS PAINTER, J. PAINTER & Sons, Pittsburgh, Pa.
A. JOHN EVERSON, EVERSON, GRAFF & MACRUM. Pittsburgh, Pa.

RULES.

I.

OBJECTS.

The objects of the AMERICAN INSTITUTE OF MINING ENGINEERS are to promote the Arts and Sciences connected with the economical production of the useful minerals and metals, and the welfare of those employed in these industries, by means of meetings for social intercourse, and the reading and discussion of professional papers, and to circulate, by means of publications among its members and associates, the information thus obtained.

II.

MEMBERSHIP.

The Institute shall consist of Members, Honorary Members and Associates. Members and Honorary Members shall be professional mining engineers, geologists, metallurgists or chemists, or persons practically engaged in mining, metallurgy, or metallurgical engineering. Associates shall include all suitable persons desirous of being connected with the Institute and duly elected as hereinafter provided. Each person desirous of becoming a member or associate shall be proposed by at least three members or associates, approved by the Council, and elected by ballot at a regular meeting upon receiving three-fourths of the votes cast, and shall become a member or associate on the payment of his first dues. Each person proposed as an honorary member shall be recommended by at least ten members or associates, approved by the Council and elected by ballot at a regular meeting on receiving nine tenths of the votes cast; *provided*, that the number of honorary members shall not exceed twenty. The Council may at any time change the classification of a person elected as associate, so as to make him a member, or *vice versa*, subject to the approval of the Institute. All members and associates shall be equally entitled to the privileges of membership; *provided*, that honorary members, and members and associates permanently residing in foreign countries shall not be entitled to vote or to be members of the Council.

Any member or associate may be stricken from the list on recommendation of

the Council, by the vote of three-fourths of the members and associates present at any annual meeting, due notice having been mailed in writing by the secretary to the said member or associate.

III.

DUES.

The dues of members and associates shall be ten dollars, payable upon election, and ten dollars per annum, payable in advance at the annual meeting; *provided*, that persons elected at the February meeting shall not be liable to dues at the first annual meeting following; and members and associates permanently residing in foreign countries shall be liable to such annual or other payments only as the Council may impose, to cover the cost of supplying them with publications. Honorary members shall not be liable to dues. Any member or associate may become, by the payment of one hundred dollars at any one time, a life member or associate, and shall not be liable thereafter to annual dues. Any member or associate in arrears may at the discretion of the Council be deprived of the receipt of publications, or stricken from the list of membership when in arrears for one year; *provided*, that he may be restored to membership by the Council on payment of all arrears, or by re-election after an interval of three years.

IV.

OFFICERS.

The affairs of the Institute shall be managed by a Council, consisting of a President, six Vice-Presidents, nine Managers, a Secretary, and a Treasurer, who shall be elected from among the members and associates of the Institute at the annual meetings, to hold office as follows:

The President, the Secretary, and the Treasurer for one year, (and no person shall be eligible for immediate re-election as President who shall have held that office subsequent to the adoption of these rules, for two consecutive years) the Vice-Presidents for two years, and the Managers for three years; and no Vice-President or Manager shall be eligible for immediate re-election to the same office at the expiration of the term for which he was elected. At each annual meeting a President, three Vice-Presidents, three Managers, a Secretary and a Treasurer shall be elected, and the term of office shall continue until the adjournment of the meeting at which their successors are elected.

The Council elected under the former rules of the Institute at the annual meeting of 1873, shall continue in office until the adjournment of the annual meeting of 1874; and the Vice-Presidents and Managers shall classify themselves by lot or otherwise, so that three Vice-Presidents and three Managers shall retire and be ineligible for re-election in 1875, after which the terms of office shall be as hereinbefore provided. The duties of all officers shall be such as usually pertain to their offices, or may be delegated to them by the Council or the Institute; and the Council may in its discretion require bonds to be given by the Treasurer. At each annual meeting the Council shall make a report of proceedings to the Institute, together with a financial statement.

Vacancies in the Council may occur by death or resignation; or the Council may by vote of a majority of all its members declare the place of any officer vacant, on his failure for one year, from inability or otherwise, to attend the Council meetings or perform the duties of his office. All vacancies shall be filled by the appointment of the Council, and any person so appointed shall hold office for the remainder of the term for which his predecessor was elected or appointed; *provided*, that the said appointment shall not render him ineligible at the next annual meeting.

Five members of the Council shall constitute a quorum; but the Council may appoint an Executive Committee, or business may be transacted at a regularly called meeting of the Council, at which less than a quorum is present, subject to the approval of a majority of the Council, subsequently given in writing to the Secretary, and recorded by him in the minutes.

V.

ELECTIONS.

The annual election shall be conducted as follows: Nominations may be sent in writing to the Secretary, accompanied with the names of the proposers, at any time not less than thirty days before the annual meeting; and the Secretary shall, not less than two weeks before the said meeting, mail to every member or associate (except honorary members, or foreign members or associates,) a list of all the nominations for each office so received, stamped with the seal of the Institute, together with a copy of this rule, and the names of the persons ineligible for election to each office. And each member or associate, qualified to vote, may vote, either by striking from or adding to, the names of the said list, leaving names not exceeding in number the officers to be elected, or by preparing a new list, signing said altered or prepared ballot with his name, and either mailing it to the Secretary, or presenting it in person at the Annual Meeting; *Provided*, that no member or associate in arrears since the last annual meeting, shall be allowed to vote, until the said arrears shall have been paid. The ballots shall be received and examined by two Scrutineers, appointed at the Annual Meeting, by the presiding officer; and the persons who shall have received the greatest number of votes for the several offices, shall be declared elected, and the Scrutineers shall so report to the presiding officer. The ballots shall be destroyed, and a list of the elected officers, certified by the Scrutineers, shall be preserved by the Secretary.

VI.

MEETINGS.

General meetings of the Institute shall take place on the fourth Tuesday of February, May and October; and the May meeting shall be considered the annual meeting, at which a report of the proceedings of the Institute, and an abstract of the accounts, shall be furnished by the Council. Special meetings may be called whenever the Council sees fit; and the Secretary shall call a special meeting on a requisition signed by fifteen or more members. The notices for special meetings shall state the business to be transacted, and no other shall be entertained. All notices may be given by circular, mailed to members and associates, or through the Bulletin published in the regular organ of the Institute, at the discretion of the Council.

Every question which shall come before any meeting of the Institute shall be decided, unless otherwise provided by these rules, by the votes of the majority of the members then present. The place of meetings shall be fixed in advance by the Institute, or, in default of such determination, by the Council, and notice of all meetings shall be given by mail, or otherwise, to all members and associates, at least twenty days in advance. Any member or associate may introduce a stranger to any meeting; but the latter shall not take part in the proceedings without the consent of the meeting.

VII.

PAPERS.

The Council shall have power to decide on the propriety of communicating to the Institute any papers which may be received, and they shall be at liberty, when they think it desirable, to direct that any paper read before the Institute shall be printed in the Transactions. Intimation, when practicable, shall be given at each General Meeting, of the subject of the paper or papers to be read, and of the questions for discussion at the next meeting. The reading of papers shall not be delayed beyond such hour as the presiding officer shall think proper, and the election of members or other business may be adjourned by the presiding officer, to permit the reading and discussion of papers.

The copyright of all papers communicated to, and accepted by, the Institute, shall be vested in it, unless otherwise agreed between the Council and the author. The author of each paper read before the Institute shall be entitled to twelve copies, if printed, for his own use, and shall have the right to order any number of copies at the cost of paper and printing, provided said copies are not intended for sale. The Institute is not, as a body, responsible for the statements of fact or opinion advanced in papers or discussions at its meetings.

VIII.

AMENDMENTS.

These rules may be amended at any annual meeting by a two-thirds vote of the members present.

Coal in Borneo.

THE discovery of good coal in the island of Borneo is an event which may prove of great importance to the Indian possessions of the English. The fields are described by Mr. JOHN S. ATCHISON, law agent of "Rajah" Brooke, of Sarawak. He says: "The attention of the Sarawak authorities has lately been specially directed to extensive coalfields in the district of Luigga, extending over a tract of country of many miles in extent. This coal, which has been pronounced by practical coal miners capable of standing comparison with English north-country steam coal, and much superior to any hitherto discovered in these parts, lies in seams of four and one-half feet in thickness, and from its gradient and position can be very readily worked. Situated within five miles of a navigable river, a tramway would bring the coals for shipment by lighters to vessels of 400 or 500 tons on the main river, and thence one tide on a broad and safe stream (the Batang Lupar, two miles wide) would carry them out to sea. If it should be considered desirable to make but one carriage from the mines to the shipping, and avoid intermediate lightage, a tramway of about 18 miles in length could be made to the shipping direct. Sarawak has the advantage of being less by one-half the distance from Singapore than the coal mines at Labuan, but it is expected that coal of the quality discovered would find many other Eastern and China markets besides Singapore, important as that station is. I am directed to state that further and more complete surveys and investigations are being made by experienced miners, and it is hoped that very shortly full particulars of the important mines will be laid before the public at home. The Rajah of Sarawak is aware of the importance to his possessions such discoveries may prove, and will give every assistance to coal-mining enterprise on terms which may be arranged of a favorable character, but at the same time is (as I have before stated) collecting further detailed particulars for the purpose of satisfying capitalists desirous of undertaking the working of these important mines, as he is aware that any unsuccessful undertaking would be productive of more harm than benefit to his dominion. The magnitude of the work, and its important bearing on the great coal question of the day, justifies a communication to you of this nature. It is found that English capital is necessary to fully develope the work, and that local enterprise will not altogether suffice. It is confidently believed that first-class Sarawak steam coal can be sold in Eastern ports at prices very far below the price of English steam coal, and with a large margin of profit." Mr. ATCHISON's object apparently is to enlist the energies of English capitalists in the development of this new coal supply, and he adds that "further and full particulars will very shortly be ready, to any inquiry that may be addressed to me by persons *bona fide* interested in such undertakings, and who may be desirous to inquire into all practical details."

Increasing Temperature of the Earth.

WHEN ALEXANDER VON HUMBOLDT wrote the "Cosmos," the deepest known bore-hole was that of Oeynhausen, near Minden, in Westphalia, reaching to a depth of 2220 ft. Rhenish, or 2284 ft. English. Since October, 1872, however, the great bore-hole, which was sunk through rock-salt at the village of Sperenberg, near Berlin, has reached the considerable depth of 4052 ft. Rhenish, or 4169 ft. English, undoubtedly the greatest depth which has ever yet been attained. This bore-hole was used for making observations on the temperature of the earth's crust, and OBERBERGRATH DUNKER, of Halle, has recently published a pamphlet on the results obtained. For these observations WALFERDIN's ordinary maximum thermometer could not be used, but the so-called gas-thermometer of MAGNUS was substituted for it. The temperature thus obtained was at

Rhenish ft.	English ft.	Reaum. deg.	Fahr. deg.
100	102.9	11.0	57.2
1000	1029	18.6	73.8
2000	2058	26.4	91,4
3000	3087	34.4	109.4
4042	4159	38.2	118.6

With respect to these results the author remarks, that in this bore-hole, which is filled with water, regard must be taken to the circulation of the latter, as the warmer water at the bottom, having the least specific gravity, has a tendency to rise, and the upper strata an opposite tendency to sink to the bottom, consequently, when measuring temperatures in very deep bore-holes, the index of the thermometer must show somewhat too high near the surface, and somewhat too low at the bottom for the actual temperature of the rock.

THE COAL TRADE.

NEW YORK, May 29, 1873.

Business in the Anthracite trade seems to be reviving somewhat, but is not really active yet. There appears, however, to be a general impression that it is certain to be better, and that those dealers who have coal on hand, will eventually find it profitable to them. No one seems to be afraid of holding coal, though the middlemen naturally prefer a brisk trade to the best chances of making money by holding on through a long season of dullness.

We add to the quotations published last week, the following from the Lehigh Coal Exchange.

Lump	$5.45
Broken	5.30
Egg	5 30
Stove	5 45
Chestnut	4.75

We have not observed the activity in bituminous coal, which is reported in some quarters. Dealers do not complain, but the impression that coal is scarce is one that we believe is not warranted by the circumstances.

The following is the average of the Scranton sale, as made up by Mr. JOHN MOORE, Room 74, Trinity Building.

		June. average.	May.	advance.
Lump	7,500 tons.	$4.31	$4.27	4 c
Steamer	7,500 "	4 44	4.22½	21½c
Broken	16,000 "	4.62	4 49	13 c
Egg	12,000 "	4.83	4.67	16 c
Stove	25,000 "	5.17½	5 10	7½c
Chestnut	12,000 "	4.44	4.30	14 c
	80,000 "	$4.75½	$4 65½	10½c

Anthracite Coal Trade for 1873 and 1873.

The following table exhibits the quantity of Anthracite Coal passing over the following routes of transportation for the week ending May 24, 1873, compared with the week ending May 25, 1872.

COMPANIES.	1872. WEEK.	1872. TOTAL.	1873. WEEK.	1873. TOTAL.
*Phila & Reading R.R†.	103 176	1,707,618	101,316	1,937,582
*Schuylkill Canal	24 767	2 5,157	21,896	162,406
*Lehigh Valley R. R.	47,793	1,4 0,036	65,819	1,396,246
Lehigh & Sus. R. R.	23,347	614,223	37,357	753,118
" " Canal	25 068	145,772	25,560	131,802
Scranton North	16,058	247,329	17,295	264,782
" South	39,387	848,848	50,456	899,233
Penn. Coal Co., rail	22,434	444 855	31,890	4 6,591
" " canal	238	1,076	247	1,991
Del. & Hud. C. Co., Canal	49,685	247,606	48 53	264,978
" " East	15,363	291,587	8,301	151,171
" " West	8,294	135 083	10,618	172 197
" " South	6,004	157,543	976	171,203
Shamokin	12,938	178 559	13,815	207,328
Trevorton	....	...	....	....
Lykens Valley Coal Co.	....	....	....	....
Wyoming North	....	....	....	....
Wyoming South	....	...	....	....
P. N. Y. C. & R. R. Co.	12,609	261,661	13,916	281,917
Williamstown Col'y	....	.....	....	....
Big Lick Col	....	.....	....	....
Total	436,081	6,863,847	447,705	7,152,906
1872			436,081	6,866,847
Increase			11,624	286,059
Decrease				

These figures are for the week and fiscal period commencing Nov. 30

† Less coal transported for Company's use and Bituminous coal.

Bituminous Coal Trade, 1873 and 1873.

The following table exhibits the quantity of Bituminous Coal assing over the following routes of Transportation for the week ending May 24, 1873, compared with week ending May 25, 1872.

COMPANIES.	1872. Week.	1872. Year.	1873 Week.	1873 Year.
C. & O. Canal	18,185	174,245	19,428	152,854
B. & O. R. R.	29,442	469,612	27,794	531,855
Penn. S. Line	....	.....	897	37,050
H. & B. T. R. R.	7,441	117.295	7,927	189,085
*Harrisburg & D.	10,042	209,077	6,815	146,417
*L. V. R. R.	496	13,550	614	13,142
P. & N.Y.C. & R. Co.	8,445	150,330	5,908	132,412
Cumberl'd Branch Canal	5,062	56,138	2,135	24 560
" Railroad	469	5,468	2,914	44,194
Total	79,552	1,196,115	74,432	1,271,589
	74.432			1,196,115
Decrease	5,120			
Increase				85,474

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company for the week ending Saturday, May 24, 1873.

	WEEK.	SEASON
North	88,260 02	977,823 19
South	976 08	121,203 01
Total 1873	89,236 10	1,099,027 00
Corresponding time in 1872:		
North	56,895 18	1,000,933 13
South	6,003 13	137,543 06
Total, 1872	62,899 11	1,138,476 19
Increase North		
Decrease North		
Increase South		
Decrease South		
Increase		
Decrease	3,663 01	99,449 19

Schuylkill Canal.

Report of coal transported over the Schuylkill Canal for the week ending Saturday, May 13, 1873.

	Tons. Cwt.
From Schuylkill Haven	20,376 00
" Port Clinton	953 00
Total for week	21,329 00
Previously this year	71,840 10
Total	93,169 10
To same time last year	153,181 09

Philadelphia & Reading Railroad and Branches.

COAL TONNAGE

For the Week ending Saturday, May 24, 1873.

BY RAILROAD—ANTHRACITE.

PASSING OVER MAIN LINE AND LEB. VAL. BRANCH.

	Tons. Cwt.
From St. Clair	26,676 06
" Port Carbon	5 204 18
" Pottsville	2,679 04
" Schuylkill Haven	26,414 18
" Pine Grove	4,851 04
" Tamaqua	10,660 01
" Harrisburg	
" Dauphin	4,868 02
Total	81,354 12

FOR SHIPMENT BY CANAL.

Passing Frackville Scales	6,780 16
" Mill Creek "	954 15
" Schuylkill Valley Scales	1,054 04
" Mt. Carbon "	1 344 19
" Cressona "	7,258 05
" Pine Grove "	714 06
" Tamaqua "	1,668 18
Total	19,771 03

SHIPPED WESTWARD VIA CATAWISSA AND WILLIAMSPORT BRANCH AND NORTHERN CENTRAL RAILROAD.

Via Catawissa & Williamsport Br.	112 19
" N. C. R. R. passing Locust Gap	2 372 08
" " " Shamokin	5,063 12
" " " Herndon	....
Total	7,548 19

SHIPPED WEST OR SOUTH FROM PINE GROVE.

Via Schuylkill & Susquehanna R. R.	283 11
" Lebanon & Pine Grove Branch	808 11
Total	1,092 02

CONSUMED ON LATERALS.

From Frackville Scales	455 12
" Mill Creek "	604 11
" Schuylkill Valley Scales	1,134 07
" Mt. Carbon "	575 02
" Cressona "	154 16
" Pine Grove "	30 06
" Tamaqua "	4 8 13
Total	3,463 07

LEHIGH AND WYOMING COAL.

Received via Silverbrook Junction, Sent East	5,788 19
Cat. & Wpt. rr. Sent West	4 12
" " Rupert, Cat. & Wpt. Br.	60 05
" " Allentown, E. Penn'a rr.	32 18
" " Alburtis, " "	
" " Oreland, G. & N. Br.	900 02
" " Willow Street R. R.	530 00
Total	7,316 13

BITUMINOUS.

From Harrisburg	6,115 04
" Connecting R. R., G. & N. Br.	
" Junction R. R.	
Total	6,915 04

COAL FOR COMPANY'S USE.

Anthracite	5,019 09
Bituminous	216 02
Total	5,235 11

RECAPITULATION.

	Total for Week.	Corres'p'g week last year.	Increase and Decrease.
Passing over Main Line and Leh. Val. Branch	81,354 12	91,239 15	d 9,885 03
For Shipment by Canal	19,771 03	21,446 03	d 1,675 00
Shipped Westward via Northern Central R. R.	7,511 19	6,294 05	i 1,254 14
Shipped West or South from Pine Grove	1,092 02	2,167 14	d 475 12
Consumed on Laterals	3,463 07	2,2.7 00	i 1,236 07
Lehigh and Wyoming Coal	7 316 13	1 246 18	i 6,069 15
Total Anthracite paying freig't	121,146 16	124,621 15	d 3,474 19
Bituminous	6,815 04	10,042 03	d 3 226 19
Total of all kinds paying freig't	127,962 00	134,663 18	d 6,701 18
Coal for Company's use	5,245 11	4 342 05	i 893 06
Total Tonnage for Week	133,147 11	139,006 03	d 5,808 12
Previously this year	2340741 13	2221963 01	i 118,778 12
Total to date	2473939 04	2360969 04	i 112,970 00

SHIPPED BY CANAL.

From Schuylkill Haven	19,723 00	21,876 10	d 2,153 10
" Port Clinton	2,173 00	1,375 00	i 798 00
Total Tonnage per Week	21,896 00	23,251 10	d 1,355 10
Previously this year	140,509 10	204,162 09	d 63,652 19
Total to date	162,405 10	227,413 19	d 65,008 03

Northern Central Railway, Shamokin Division.

Below is the return of Coal sent over the Shamokin Division of the N. C. R. W., for the 7 days ending May 24, 1873.

	Tons.	Cwt.
East	1,095 06	
West	12,719 15	
		13,815 01
Same time last year		12,937 16
Increase		877 05
Decrease		
Total amount shipped to date		207,327 19
Same time last year		178,558 18
Increase		28,769 01
Decrease		

Pennsylvania Coal Company.

Shipments of Pittston Coal for the week ending May 24, 1873.

	1873. WEEK.	1873. YEAR.	1872. WEEK.	1872. YEAR.
By Railway	31,890 08	406,991 14	22,434 08	444,895 07
" Canal	246 16	1,991 09	238 02	1,070 06
	32,137 04	408,983 03	22,672 10	445,925 13
Decrease 1873	36,942 10			

Report of Coal Transported over the Lehigh Canal

For the week ending May 24, 1873.

REGIONS SHIPPED FROM	TIDE tons. ct.	LOCAL tons. ct.	TL. WEEK tons cwt.	TL. DATE tons. cwt.
Mauch Chunk Region	4,611 16	3,056 00	7,678 05	43 738 08
Mauch Chunk Region Hazardville				
Beaver Meadow Region	782 01	4,065 19	4,848 00	18,113 06
Mahanoy Region		574 10	574 10	2,060 19
Hazleton Region	1,428 00	5, 8 18	6,719 18	37,462 13
Upper Lehigh Region	97 00	866 03	963 03	5,618 05
Wyoming Region	3,095 03	1,710 13	4,805 16	26,817 16
Wyoming Region, Hazardville				
Total	10,024 00	15,755 12	25,579 12	131,802 07
Previously reported	40,162 19	66 059 16	106,222 15	
Total to date	50,186 19	81,815 08	131,802 07	
Corresponding week last year	55,814 13	89,957 01	145,771 14	
Increase				
Decrease	5,627 14	8,311 13	13,968 07	

DISTRIBUTION.	WEEK 1873.	WEEK 1872.	YEAR. 1873.	YEAR. 1872.
Consumption on line of Lehigh Canal	2,703 11	3,121 18	12,831 06	18,141 18
Passed into Morris Canal to Tidal Points	61 11	324 19	445 03	492 03
Passed into Morris Canal to Local Points	996 01	617 00	5,790 19	4,029 01
Passed into Del. & Rar. Canal to Tidal Points	9,939 07	9,195 14	49,741 11	85,062 07
Passed into Del. & Rar. Canal to Local Points	396 08	569 19	2,482 00	3,962 18
Consumed on line Delaware Div. Canal	978 13	1,135 13	6,197 06	8,919 15
Passed through to Bristol	10,480 16	10,102 11	54 813 17	80,813 16
	25,579 12	25,067 14	131,802 07	145,771 14

Penn. and P. Y. R. R.—Coxton, Pa.

Coal tonnage for week ending May 24, 1873.

	Week. Tons. Cwt.	Total. Tons. Cwt.
Anthracite received:		
From Lehigh Valley R. R.	8,630 11	174,523 05
" Lack. & B. R. R.	444 12	14,653 17
" Pleasant Valley R. R.	3,886 10	77,188 12
" Sul. & Erie R. R.	954 15	15,551 03
Total	13,916 08	281,916 17
Same time last year	12,608 16	261,560 12
Increase	1,307 12	20,356 05
Decrease		
Distributed:		
To Lehigh Valley R. R.	60 07	19,662 15
To Lack. & B. R. R.		607 03
To S. Central R. R.	6,455 03	63,376 17
To Ithaca & A. R. R.	2 057 01	41,411 08
To Erie R. W. Pockets for shipm't.	3,055 01	95,851 09
To individuals on line of road	250 14	16,730 04
To points at & above Coxton for use of Co.	488 17	12,976 04
To points between Waverley and Elmira	1,549 04	31,090 17
Total	13,916 08	281,916 19
Bituminous received from BARCLAY R. R.		
Shipped north from Towanda	5 895 06	131,590 16
Shipped south from Towanda	12 10	795 03
Northern Central R. R.	....	45 14
Total	5,907 16	132,431 13
Same time last year	8,412 14	150,730 03
Increase		
Decrease	2,504 15	18,298 10
Distributed:		
To Erie Railway	5,682 07	113,787 12
To So. Central R. R.	272 19	17,650 18
To Ithaca Valley R. R.	....	117 09
Lehigh Valley, R. R.	....	422 14
To individuals on line of Railroad	12 10	394 16
To points on line of road for use of Company	....	118 04
Total	5,907 16	132,431 13
Grand totals transported		
Anthracite	13,916 08	281,916 17
Bituminous	5,907 16	132,431 13
Total	19,824 04	414,348 10
Same time last year	21,021 10	442,291 15
Increase		2,057 15
Decrease	1,197 06	

Report of Coal Transported over Central R.R. of N. J. (Lehigh and Susq. Div.)

Week ending May 24—Compared with same time last year.

REGION SHIPPED FROM.	TIDE. tons ct.	LOCAL. tons ct.	CANAL. tons ct.	TL WEEK tons cwt.	TL. DATE tons. cwt.
Wyoming	25941 00	14121 00	3073 12	40381 01	706214 17
Upper Lehigh		2799 10	1170 18	3970 08	78631 08
Beaver Meadow	1857 08	1514 02	3126 19	6498 09	78186 11
Hazleton		483 00	6662 09	7145 09	44594 18
Mauch Chunk	2,409 17	1927 18	7696 10	12034 05	182500 13
Total	30203 05	17844 19	21729 08	70032 12	1090018 05
Prev'ly reported	498160 01	417634 05	102651 02	1018435 13	
Total to date	528363 11	435463 04	125180 10	1,088468 05	
Same time 1872	441972 07	293999 00	86870 05	823841 12	
Increase	83306 04	141470 04	38310 05	264626 13	
Decrease					

DISTRIBUTION.	WEEK 1873.	WEEK 1872.	YEAR 1873.	YEAR 1872.
Forwarded East by Rail to Tidal points	30203 05	26923 02	528363 11	444972 07
Forwarded East by Rail to Local points	8230 13	4807 07	183571 06	136910 08
Forwarded East by Rail use Central Division	1759 10	1329 08	38937 10	30286 08
Forwarded East by Rail use L. C. S.	158 10	177 04	3240 06	3073 11
Delivered at and above Mauch Chunk	1351 17	1124 04	32400 16	21689 10
Delivered at Coalport & Hazard for Canal	22320 00	15498 03	150291 17	104132 00
Delivered to L. V. R. R. at Packerton	414 09	394 06	13316 19	6458 17
Delivered to L. V. R. Rd at Sugar Notch	3495 11		42511 12	
Delivered to L. & B. R. R. at Plymouth Bridge	5143 17	3532 09	97389 05	79347 11
Total	70582 12	53846 03	1089018 05	823841 12

Report of Coal Transported over Lehigh Valley Railroad

Report of coal tonnage for the week ending May 24, 1873, with totals to date, compared with same time last year.

WHERE SHIPPED FROM.	WEEK. Tons. Cwt.	TOTAL Tons. Cwt.
Total Wyoming	16,187 16	364,115 00
" Hazleton	47,239 05	881,564 11
" Upper Lehigh	26 12	1,835 10
" Beaver Meadow	12,644 10	291,010 19
" Mahanoy	10,551 05	181,443 19
" Mauch Chunk	108 19	2,098 52
Total	86,757 07	1,722,065 01
Same time last year	90,245 18	1,703,337 14
Increase	.....	18,727 07
Decrease	3,488 11	.....
Forwarded East from Mauch Chunk by rail	65,819 06	1,356,246 05
Same time last year	67,793 01	1,419,036 08
Increase	.....	.....
Decrease	1,973 13	13,790 03

DISTRIBUTED AS FOLLOWS.

Local East of Mauch Chunk	1,391 14	29,722 02
Forwarded East for use L. V. R.	911 09	26,6.9 00
Delivered to Furnaces and Manufacturing Companies	12,857 09	338,087 04
Delivered to Cat & Fog. R. R.	95 11	2,495 16
" " East Penn R. R.	27 06	5,914 12
" " North Pennsylvania Railroad	4,9.5 17	133,8.5 17
" " Port Del	5,072 03	47,902 03
" " East' Amboy Railroad	2,906 19	136,743 15
" " Morris and Essex Railroad	26,743 10	393,6.9 03
" " Bel Del Railroad	9,725 16	251,0.7 13
Delivered at and above Mauch Chunk for use of L. V. R. R.	1,220 01	33,129 06
To P. & N. Y. & M. R.	8,653 11	174,621 05
To Northern Central R. R.	493 17	5,965 09
To D. H. & W. R. R.	950 11	16,07.1 19
To L. & S. R. R. at Packerton for rail	180 09	6,2 4 13
To individuals at Mauch Chunk	19 18	1,632 16
To individuals above Mauch Chunk	252 00	7,9.6 14
To L. &S.R.R., at Penn Hav., for railroad		1,541 10
Do. for canal	6,709 18	37,4 2 13
To Lehigh Canal Mauch Chunk	2,394 14	11,112 01
To Chicopee Railroad	5 00	50 00
To L. & S. R. R. at Lack. June.	32 00	29,498 06
Total	86,757 07	1,722,065 01

Statement of Coal Transported over Cumberland and Pennsylvania Railroad

During the week ending Saturday May 24, and during the year 1873, compared with the corresponding period of 1872.

WEEK.

	C. & O. C'l Tons. Cwt	B. & O. R. R. Tons. Cwt.	Pa. S. Line Tons. Cwt.	Total. Tons. Cwt.
1873	19,424 00	27,794 00	896 19	48 119 00
1872	18,185 10	29,442 11	....	47,628 01
Increase	1,242 10	....	896 19	491 07
Decrease	..	1,648 02	..	....

YEAR.

1873	152,863 17	531,855 02	37,049 12	721,768 11
1872	174,265 08	469,611 13	....	643 867 00
Increase	....	62,243 10	37,049 12	77,901 11
Decrease	21,301 11	....	....	....

Cumberland Branch R. R.

WEEK.

	To C. & O. Canal. Tons. Cwt.	To P. & O. R. R. Co Tons. Cwt.	Total. Tons. Cwt.
1873	2,135 03	2,914 07	5,049 10
1872	5,761 12	468 17	5,530 09
Increase	—	2,445 10	.....
Decrease	2,926 09	.....	480 19

YEAR.

1873	24,559 12	44,193 19	68,753 11
1872	56,139 03	5,467 13	61,605 16
Increase	....	38,726 06	7,147 15
Decrease	31,578 11	....	....

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company for the week ending Saturday, May 24, 1873.

	WEEK.	SEASON.
By Delaware and Hudson Canal	48 253	264,938
By Railroad, East	8,30.	161,171
" West	10,618	172,197
" South	976	121,203
Total 1873	68,148	709,509
Corresponding time in 1872 :		
By Delaware and Hudson Canal	49,685	247,636
By Railroad, East	15,363	26 ,587
" West	8,294	135,963
" South	6,004	137,543
Total	79,346	781 819
Decrease	72,310	

Delaware Lackawanna & Western Rail Road Company.

Coal transported on the Delaware, Lackawanna, & Western Railroad for the week ending Saturday, May 24, 1873.

	WEEK. Tons. Cwt.	YEAR. Tons. Cwt.
Shipped North	17,2.5 02	2 4,782 05
Shipped South	50,456 06	899,233 04
Total	67,661 08	1,164,015 09
For the Corresponding time last Year :		
Shipped North	16,027 19	247,329 10
Shipped South	39,387 02	848,647 11
Total	55,417 01	1,096,177 01
Increase	12,244 07	67,838 08
Decrease	.....	.....

Prices of Coal by the Cargo.

[CORRECTED WEEKLY.]

	AT NEW YORK. May 29. R. A.	W. A.	AT PHILADELPHIA. May 29. R. A.	W. A.
SCHUYLKILL.				
Lump	$— —	$5 45	— —	4 10
Steamer	— —	5 45	— —	4 10
Broken	5 70	5 45	4 35	4 10
Egg	5 85	5 60	4 60	4 25
Stove	6 05	5 75	4 70	4 40
Chestnut	5 20	5 93	5 35	3 63
Pea	— —	— —	— —	— —
LEHIGH.				
Freight to New York 80 cents.				
Lump, (on board)	— —	5 35	— —	— —
Broken	— —	5 50	— —	— —
Egg	— —	5 50	— —	— —
Stove	— —	5 60	— —	— —
Chestnut	— —	4 75	— —	— —
Pea	— —	— —		
SPECIAL COALS *				
Honey Brook, L.'h W. A.	4 70@5 60		— —	— —
Spring Mountain " "	— —@— —		— —	— —
Sugar Loaf " "	— —@— —		— —	— —
Room Run " "	4 70@5 60		— —	— —
Hill & Harris " "	4 70@5 60		— —	— —
Shamokin " "	4 70@5 60		— —	— —
Lykens Valley " "	4 85@6 10		— —	— —
Broad Top " "	6 60@— 10		5 35	— —

Company Coals.

May, 1873.

	L.	Str.	Gra.	Eg.	Sto.	Chest
*Scranton at E. Port	4 35	4 25	4 55	4 75	5 00	4 35
Pittston at Weehawken	4 60	4 60	4 60	5 00	5 50	4 70
*Lackawana at Weehawken	4 70	4 70	4 90	5 75	5 60	4 70
Wilk'b're at Hoboken	4 55	4 75	4 90	5 10	5 45	4 55
Old Co. Lehigh at Pt. John'n	5 00	—	5 35	5 35	5 80	4 70
New York Coal Exchange	5 35	—	5 20	5 20	5 35	4 65

For freights to different points see "Freights

*To contractors only.

Prices at Baltimore—May, 1873.

Wholesale Prices to Trade.

Wilkesbarre, by cargo or car load	$5 75@6 00
Pittston and Plymouth, do	5 50@5 75
Shamokin Red or White Ash, do	5 50@5 75
*Lykens Valley Red Ash, do	@5 80
By retail, all kinds per ton of 2,240 lbs	7 50@8 00
*George's Creek and Cumberland f. o. b. at Locust Point for cargoes	@5 00
Fairmont and Clarksburg gas f. o. b. at L. Point	6 50
Kanawha Cannel, coarse	@12 00

* Freight to New York $2 15.

BITUMINOUS COALS.

Kittaning Coal Co.'s Phœnix Vein, f. o. b. at Phila	$
Lemon " " "	
Cumberland Vein Coal	
Tyrconnel f. o. b.	$7 00

Prices at Georgetown, D.C., and Alexandria, Va.

May, 1873.

George's Creek and Cumberland f. o. b. for shipping $4 60@4 75

Prices at Havre de Grace, Md.

May, 1873.

Wilkesbarre and other White Ash for Cargoes	$ @....
Lykens Valley	@....
Shamokin Red or White Ash	....

Bituminous Coals (Cumberland).

Georgetown, F.o.b	$4 60
Baltimore	5 00
New York	7 25
South Amboy	6 75

Prices of Foreign Coals.

May, 1873.

Duty 75 c. per ton.

Corrected weekly by ALFRED PARMELE, No. 32 Pine street, N. Y.

Liverpool Gas Coking	— @— —
" " Cannel	17 00@— —
" House "	22 00@23 00
" Orrel	20 00@— —

Per ton 2,240 lbs., ex-ship.

PRICES FROM YARD.

Liverpool House Orrel, screened	$20 00@22 00
" Cannel,	17 00@ ...

Per ton 2,000 lbs. delivered.

Prices of Gas Coals.

May, 1873.

PROVINCIAL.

Corrected weekly by Louis J. Belloni, Jr., 41-43 Pine st., N.Y.

	Coarse	Slack.
Rock House	$2 50	$1 00
Gowrie	2 00	0 00

Corrected by Bird, Perkins & Job, 27 South street.

	Coarse	Culm of Coal,
Picton	nett $2 50	1 50
Sydney	2 50	1 00
Lingan	2 50	0 00
Caledonia	2 00	2 50

A discount from the prices of the coarse Coal on purchase of 5000 tons and upwards. Duty on all slack coal or Culm : 40c. per ton of 28 bushels, 80 pounds to the bushel. On all bituminous coal or shale : 75 cents per ton of 28 bushels.

	AMERICAN.	Nominal quo Currency.
Westmoreland	f. o. b.	$6 50 @7 00
Fairmount Gas Coal Co. of N. Y	"	6 50 @7 00
Despard Coal Co	"	6 50 @7 50
Penn	"	6 50 @7 00
Newburg Orrel Gas	"	6 50 @7 00
West Fairmount Gas Coal	"	6 50 @7 00
Redbank Cannel, Penn	"	6 50 @7 00
	AT PHILADELPHIA.	
Westmoreland	"	7 50 @8 00

Foreign and Provincial Freight

May, 1873.

Foreign.

Newcastle and Ports on Tyne, per keel of 21 1-5 tons £ Liverpool, 5 per cent primage

TO NEW YORK.

Provincial

Sydney	$3 50
Lingan	3 50
Cow Bay	3 75
Port Caledonia	3 50
Little Glace Bay	3 50

TO BOSTON.

Sydney	3 00
Lingan	3 00
Cow Bay	3 00
Port Caledonia	3 00
Little Glace Bay	2 90

Freights.—May, 1873.

TO EASTERN PORTS.	Cumberland. From Georgetown.	Cumberland. From Baltimore	Anthracite. From Philada'a.	Anthracite. From Port Elis, Port Pop'r, Johnston, and Hoboken.	Anthracite. From Newburgh.	Anthracite. From Readout...
Amesbury	3 75	—	—	2 50	—	—
Bangor	3 75	3 50	—	2 25	—	—
Bath	2 87	3 00	—	2 30	—	—
Boston	3 00	3 00	—	2 15*	2 20	2 35
Bridgeport	2 50	3 00	—	1 00	—	1 20
Bristol	—	—	—	1 50	—	1 70
Cohasset Narrows	3 00	—	—	—	—	—
Derby	3 25	—	—	1 25†	—	—
Dighton	2 65	—	—	1 45	—	—
East Cambridge	2 75	2 75	—	2 15	—	—
Fall River	2 75	2 75	—	1 40	1 60	1 75
Hackensack	—	3 00	—	—	—	—
Hartford	—	3 25	—	1 50	—	1 75
Hoboken	2 10	—	—	50	—	65
Jersey City	2 10	—	—	50	—	65
Lynn	—	—	—	—	—	—
Middletown	—	—	—	1 30	—	1 50
Mystic	—	—	—	1 30	—	1 60
New Bedford	3 00	3 00	—	1 45	—	1 75
Newburyport	3 12	3 00	—	2 30	—	2 50
New Haven	2 55	2 65	—	1 00	1 20	1 25
New London	2 75	2 60	—	1 25	1 40	1 45
Newport	—	2 65	—	1 40	1 65	1 70
New York	1 15	2 15	—	50	—	—
Norwalk	2 75	2 75	—	1 00	—	—
Norwich	2 60	2 75	—	1 35	1 60	1 60
Pawtucket	3 00	3 00	—	1 50‡	—	—
Portland	3 00	3 00	—	2 15	—	— §
Portsmouth, N. H	3 00	3 00	—	2 25	—	—
Providence	2 75	2 7	—	1 40	1 65	1 75
Rockport	—	—	—	—	—	—
Saco	—	—	—	—	—	—
Sag Harbor	—	—	—	1 25	—	—
Salem	3 00	3 00	—	2 15	—	—
Stamford	—	—	—	1 00	—	—
Stonington	—	—	—	1 50	—	—
Taunton	—	—	—	1 90	—	—
Warren	—	—	—	1 40	—	—
TO RIVER PORTS						
Albany	—	—	—	—	—	55
Catskill	—	—	—	—	—	50
Cockaackie	—	—	—	—	—	50
Coeyman's	—	—	—	—	—	65
Cold Spring	—	—	—	—	—	30
Fishkill	—	—	—	—	—	20
Haverstraw	—	—	—	—	—	40
Hudson	2 50	—	—	—	—	40
New York vessels	2 00	—	—	—	—	65
Nyack	—	—	—	—	—	45
Poughkeepsie	—	—	—	—	—	30
Rhinebeck	—	—	—	—	—	30
Rondout	—	—	—	—	—	—
Saugerties	—	—	—	—	—	40
Sing Sing	—	—	—	—	—	50
Stuyvesant	—	—	—	—	—	55
Tarrytown	—	—	—	—	—	50
Troy	—	—	—	—	—	60
West Point	—	—	—	—	—	20
Youkers	—	—	—	—	—	50

† 3 c. per ton per bridge extra.
† New Haven rate and towing 25 c. extra per ton.
‡ Towing from Providence and return, extra.
§ And towing.

St. Thomas	$— — Gold
Martinique	— — "
Demerara	— — "
New Orleans	— —
Mobile	— — "

Rates of Transportation to Tide Water.

BY RAILROAD.

TO PORT RICHMOND, PHILADELPHIA.

Philadelphia and Reading Railroad, from Schuylkill Haven Lump and St., net, $1 60; Br., Egg and Ch., $1 65; Stove, $1 75 Shipping at Pt. R., 25c., for use at Phil., $2 18 from Pt. Carbon.

MAUCH CHUNK TO ELIZABETHPORT.

L. V. Railroad from Mauch Chunk to Phillipsburgh	$0 72
C. R. R., N. J., Phillipsburgh to Elizabethport	06
Shipping expenses at Elizabethport	25
Wharfage	10
Total	$2 23

MAUCH CHUNK TO PORT JOHNSTON.

L. V. R. R., or L. & S. R. R. from M. C. to Phillipsb'g	$0 72
C. R. R., of N. J., Phillipsburgh to Pt. Johnson	1 06
Shipping expenses	25
Wharfage	10
Total	$2 23

TO HOBOKEN

L. V. R. R., Mauch Chunk to Phillipsburgh	72
Morris & Essex R. R. Phillipsburgh to Hoboken	1 06
Shipping expenses	25
Wharfage	00
Total	$2 23

TO SOUTH AMBOY.

L. V. R.	72
B. & D. R. R. / Cam. & Am. R. R.	1
Shipping Expenses	35
Total	$2 23

PENN HAVEN TO ELIZABETHPORT.

L. V. R. R. Penn Haven to Phillipsburgh	84
C. RR. of N. J. Phillipsburgh to Elizabethport	1 06
Shipping expenses	15
Wharfage	20
Total	$2 25

MARKET REVIEW.

NEW YORK, May 29, 1873.

IRON—About the only feature we have to notice is that of extreme dullness. As the summer advances, there seems to be less prospect of an increase of business in Pig, and purchasers only enter the market to supply urgent wants. Prices, as a rule, are steady at about our quotations, but cash customers can, in most cases, obtain material concessions. The only sales we have to note are 150 tons Glengarnock at $47 25; 100 do., from vessel, $48@$49; and small lots from yard, $50. No. 1 brands of American are generally firm at $50, though a few outside lots, we

believe, are offering at a shade less; No. 2 may be quoted $46@$48. Grey forge, in the absence of demand, has somewhat accumulated, and may be quoted nominally $40—a sale of 100 tons is reported at $36 at the furnace. New Rails are dull. Old English are in light stock on the spot, the bulk being now held at Philadelphia; 400 tons D. H. sold at Philadelphia at $53,50, 4 mos. and interest, and $52 was offered and refused for a lot of 359 tons T at same place. Scrap is entirely nominal; we quote nominally $45 from yard. Refined Bar, &c. from store, continue dull and weak, though prices are not officially changed. Foreign cannot now be imported, except at a loss, the American being much cheaper, with the present high ruling of gold.

LONDON, May 10.—From the monthly circular of S. W. HOPKINS & Co.:

	Month ending April 30.		4 mos. ending April 30.	
	1872.	1873.	1872.	1873.
To United States....tons.	50,588	12,142	180,193	81 595
All other Countries..	27,352	42 163	99,168	107,225
Total.....tons.	77,940	54.305	279,261	188,820
Old Iron to all Countries..	8,895	9,527	27,723	29,112
Pig Iron to United States.	29,246	12,226	61,483	41,024

LEAD—Pig has been unusually quiet but stocks are held firmly at our quoted rates. Manufactured is steady at old rates.

Withdrawals from bond for consumption 23d, 24th and 26th May—

Pig Lead, Spain.....pig. 334
Pig Lead, English.....400

COPPER—The manufactures of Copper and Yellow Metal are steady at our quoted rates. There is still the same indisposition to buy Ingot beyond imperative wants, and, with this limited demand and the period close at hand for receipts of Lake, prices steadily recede; we note sales of about 100,000 lb. Lake in lots at 30½@31 cents. In English, we have only to notice the sale of 25 tons R. G. at a private price; the stock of this description is very small.

Withdrawals from bond for consumption 23d, 24th and 26th May—

Copper, Yokohama.....pkgs. 507

SPELTER—Remains very quiet, and prices are nominally as before, say 7¼@7½ cents gold for Silesian, as to brand.

Withdrawals from bond for consumption 23d, 24th and 26th May—

Spelter, Germany.....plates. 5,062

STEEL—English is in a little better supply, but still scarce, and firm at old rates.

TIN—For Pig there is scarcely any inquiry, and prices are still, to a great extent, entirely nominal; the only sale we hear of is five tons English at 36½ cents gold. Straits is held at 31@31½ cents, and Banca 37½, all gold. Plates are also dull and irregular, with prices favoring buyers; there have been some transactions at low figures. Sales have been made of 1000 bxs. Charcoal Tin, in lots, at $11.37½ for I. C.; 200 do. Coke Tin, $9.37½; 100 do., low grade, $8.87½; 500 do. Charcoal Terne, $10.25, all gold; and 500 low grade Coke Tin, before our last, at a private price.

Withdrawals from bond for consumption 23d, 24th and 26th May—

Tin from England.....bxs. 725

ZINC—The Agents' price of Mosselmann Sheet is now 10 cents less 4 per cent. gold. Manganese black oxide 3½, do. gray peroxide 5½.

METALS.

NEW YORK, May 30, 1873.

IRON.—Duty: Bars, 1 to 1¼ cents ℔ lb; Railroad, 70 cents ℘ 10 lbs.; Boiler and Plate, 1¼ cents ℔ lb; Sheet, Band, Hoop, and Scroll, 1¼ to 1¾ cents ℔ lb; Pig, $7 ℘ ton; Polished Sheet, 3 cts. ℔ lb; Galvanized 2½; Scrap Cast, $6; Scrap Wrought, $8 per ton. All less 10 per cent. No Bar Iron to pay a less duty than 35 per cent. ad val.

	Store Prices.
Pig, Scotch—Coltness ℘ ton	58 00@59 —
Gartsherrie	— —@58 —
Glengarnock	48 00@49 00
Eglinton	47 00@48 00
Pig, American, No. 1	48 00@50 00
Pig, American, No. 2	46 00@48 00
Pig, American, Forge	40 00@43 00
Bar Refined, English and American	00 00@— —
Bar Swedes, assorted sizes gold	137 50@142 50
	Store Prices, Cash.
Bar, Swedes, 1⅜ to 5 x ½ & ⅜ 2 sq. & 6 to 12 x ½ & ⅝	150 00@160 00
Bar, Refined, ⅜ to 2 in. rd. & sq. 1 to 6 in. x ½ to 1 in.	— —@100 00
Bar, Refined, 1¼ to 6 by ¼	— —@105 00
Bar, Refined, 2½ to 2¾ round 1 & 1⅛ by ¼ & 5:16	— —@107 50
Large Rounds	110 00@120 00
Scroll	120 00@165 00
Ovals and half-round	125 00@145 00
Band	— —@117 50
Horse Shoe	— —@125 00
Rods, ⅜ to 3-16 inch	105 00@150 00
Hoop	145 00@172 50
Nailrod	9¼@ 9¾
Sheet, Russia, as to assortment (gold)	16 @ 17
Sheet, Singles, D. and T. Common	—6½@— 7¼
Sheet, D. and T. Charcoal	—7¼@— 8½
Sheet, Galv'd, list 10 per cent. discount	—@— —
Rails, English (gold), ℘ ton	70 00@— —
Rails, American, at Works in Pennsylvania, currency	80 00@ 82 50

COPPER.—Duty: Pig, Bar, and Ingot, 5; Old Copper 4 cents ℔ lb; Manufactured, 45 per cent. ad val.

	All Cash.
Copper, New Sheathing, ℔ lb	— @— 43
Copper Bolts	— @— 45
Copper Braziers, 16oz. and over	— @— 45
Copper Nails	— @— 45
Copper, Old Sheathing, &c. mixed lots	22 @— 30
Copper, Old, for chemical purposes, 14@16 oz.	— @— —
Copper, American Ingot	30 @— 30¼
Copper English Pig	29½@— 30
Yellow Metal, New Sheathing & Bronze	— @— 27
Yellow Metal Bolts	— @— 32
Yellow Metal Nail, Sheathing and Slat'g	27 @— 30

LEAD.—Duty: Pig, $2 ℘ 100 lbs.; old Lead, 1½ cents ℔ lb Pipe and Sheet, 2½ cents ℔ lb.

Galena, ℘ 100 lbs	$— @— —
Spanish (gold)	6 75 @6 87½
German, do.	6 75 @6 87½
English do.	6 75 @7 00
Domestic do.	6 45 @6 65
Foreign, Refined	7 75 @7 50
Bar (net)	9 25 @— —
Pipe (net)	— — @10 50
Sheet	— — @10 50

STEEL.—Duty: Bars and ingots, valued at 7 cents ℔ lb or under 2½ cents; over 7 cents and not above 11, 3 cents ℔ lb; over 11 cents, 3½ cents ℔ lb, and 10 ℘ cent ad val. Store prices.

English Cast (2d and 1st quality) ℔ lb	— 18½@— 23
English Spring (2d and 1st quality)	— 9½@— 10½
English Blister (2d and 1st quality)	— 14 @— 18½
English Machinery	— 14½@— —
English German (2d an 1lst quality)	— 12½@— 14½
American Blister "Black Diamond"	— — @— 11½
American, Cast, Tool do.	— — @— 17
American, Spring, do.	— — @— 11
American Machinery do.	— 11½@— 12
American German, do	— 9 @— —

TIN.—Duty: Pig, Bars, and Blocks, 15 ℘ cent. ad val.; Plate and Sheets and Terne Plates, 25 ℘ cent.; Roofing 25. ad val.

	Gold ℔ lb.
Banca	— @37½
Straits	31 @31½
English	30½@30¾

PLATES.	Fair to Good Brands. Gold.	Currency
I. C. Charcoal, ℘ box	$11 00 @11 50	$13 50 @14 00
I. C. Coke	8 75 @ 9 50	10 75 @11 75
Coke Terne	8 00 @ 9 00	9 75 @11 00
Charcoal Terne	9 75 @10 25	12 00 @12 50

SPELTER—Duty: In Pigs, Bars & Plates, $1.50 p. 100 lbs.

Plates, Foreign (gold) p. 100 lb.	7 62½@—7 87½
Plates, Domestic p lb.	9 @—11

ZINC—Duty: Pig or Block, $1.50 per 100 lb.; Sheet 2½c per lb.

Sheet	per lb.—10¾@11

San Francisco Stock Market.

BY TELEGRAPH.

NEW YORK, May 29, 1873.

We have advices from the San Francisco Stock Board, dated May 22d and 27th. The market is steady with the general tendency upward. A slight decline in Chollar and Imperial are the only exceptions to the advance of the list. The reports are as follows:

			May 27.
Savage	—	—	126
Crown Point	—	—	120
Yellow Jacket	—	—	78
Kentuck, "New Issue"	—	—	11¼
Chollar Potosi	—	—	61
Gould & Curry "New Issue"	—	—	14
Belcher "New Issue"	—	—	66
Imperial	—	—	7
Raymond & Ely	—	—	89½
Meadow Valley	—	—	24¾
Eureka G. V.	—	—	—
Ophir	—	—	—
Hale and Norcross	—	—	—

American Institute of Mining Engineers.

OFFICIAL BULLETIN.

Announcements to Members and Associates.

I. All members and Associates who pay their dues ($10,) for each current year, strictly in advance, will have sent to their address, regularly and weekly, the ENGINEERING AND MINING JOURNAL, which is the organ of the Institute, and will contain the proceedings and transactions, and all important papers read before the Institute and all notices of meetings. Back numbers cannot, as a general rule, be sent.

Those members and associates who have not paid their dues for the current year, are requested to do so at once. Money may be sent in postal orders, checks or bank bills, to the Secretary, THOMAS M. DROWN, 1123 Girard street, Philadelphia, Pa.

II. It is expected that the more important papers, read before the Institute, and the debates thereon, will be published in annual or occasional volumes to which those Members and Associates will be entitled who have paid their dues.

III. All authors of papers are requested to notify the Secretary in advance of the meetings, giving the subject and length of their papers. Attention is also called, in this connection, to Rules 12 and 13.

IV. The ninth rule has been amended, so that there will be hereafter three meetings a year, in February, May and October.

THOMAS M. DROWN, Secretary.
1123 Girard street, Philadelphia, Pa.

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ROSSITER W. RAYMOND, Ph. D.
JOHN A. CHURCH, E. M. Editors.

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We printed last week an abstract of the Address of Mr. I. LOWTHIAN BELL, President of the British Iron and Steel Association, and only regret that the length of this important production forbids the publication of the whole of it in our columns. Rather than present a doubtful condensation of his ideas we preferred to take out bodily his discussion of two subjects, one being the progress of the iron industry in England, while the other is a consideration of the blast furnace as an economical user of fuel. The presidential addresses of the Association have been from the beginning distinguished by the ability which may safely be looked for when such men as BESSEMER and BELL are the speakers. In fact, the Iron and Steel Association of Great Britain has had a most flattering history. It is only five years old, but it found a country and a profession ripe for its work, and even in its infancy it was remarkably strong. The yearly list of its membership, beginning with Dec. 31, 1869, has numbered 292, 347, 424 and 522 names, and this year 65 candidates were proposed. It is to be hoped that some basis of affiliation between the Association and our own Institute may, sooner or later, be arranged. There is already a real affiliation so far as community of work, and interest are concerned and it is to be hoped that a formal expression of the close relations which exist between the two societies will take place before long.

THE English acted with promptitude at Vienna, and are rewarded by the honor of being the first to produce a complete catalogue of their country's exhibit. This catalogue presents some features which make it a useful guide to future commissioners. The *Journal* of the Society of Arts says that "the catalogue includes an alphabetical list of exhibitors, a list of exhibitors arranged in groups, and also a dictionary of objects exhibited. This is a new idea, and a very excellent one. By means of this "dictionary" we get a complete subject-matter index to all the exhibits in the British section, so that all exhibitors of any particular object, or class of objects, are shown at once. After this comes a classified list of Colonial exhibitors, and there will be besides, in future editions, a similar list of exhibits from India. There is a plan of the entire Exhibition, showing in colors the spaces allotted to each country; a similar map of the British space; and one of the fine art portion, also colored. There is also a large map of Vienna itself, a plan of the Rotunda, and a perspective view of the same. It will be seen that the book is very decidedly superior to the ordinary run of exhibition catalogues, and contains an amount of information seldom to be found in them."

The Prospects of British Trade.

WE spoke some time ago of the possibility that the manufacturer of the future might live in England, but do his work in all other countries than his own. This was, of course, a somewhat extravagant statement of the really remarkable extent to which English capital is seeking to establish itself in foreign lands. But there is even more than this to justify our remark. For months the English papers have been discussing the subject of a colonization of some other country in behalf of British capital. Hitherto, the seizure of barbarous or half barbarous lands has been made in the interest of military enterprise, or for the sake of material glory. Now the project is to domicile British capital in some country for the sake of the merchant class. Such a colonization is in fact going on in Spain in connection with the iron ore deposits of that country. Those deposits are passing rapidly into British hands, and the future production of metal within the Republic, as well as the export of ore, will lie almost entirely in English control.

But Spain cannot bear the whole load of the artificially-swollen British industrial interest, and the doctors who are eager to cure England of her ills have been looking about for some country which could be seized upon and appropriated by the merchants for manufactures, just as they seized upon India for raw products. America has been discussed and laid aside, probably from a dim idea that whatever comes to America must come prepared to be American in feeling and in purpose. Russia is too autocratic in government, forbidding in climate, and also lacks that prime necessity, ready water communication with England. But there is such a land, and it is no other than China. "Of all the fields open to British enterprise," says *Iron*, "China is undoubtedly the richest. Untold mineral wealth lies dormant in the earth, and only awaits the vivifying touch of King Rail. The introduction of a railway system into China would not only enrich the proprietors, but would confer immeasurable benefit on the inhabitants of the country. It has been proposed to tap the great province of Hunan by extending a railway from Upper Burmah to the confines of the Celestial Empire, and the project has this great advantage—that it would turn the trade of a vast section of China through a British province. Chinese exclusiveness to the contrary, notwithstanding, there is little doubt that the shriek of the steam whistle will, within a few years, be heard within the confines of the Empire of the Sun and Moon. Thus the whirligig of time brings about its revenges. The whilom empire of Timour is destined ere long to become a network of railways, built of English iron and driven by English coal. May not the island, once parcelled out among his followers by a Norman Duke, draw, at some future time, its supplies of coal and iron from the land of Confucius?"

Our contemporary seems to feel already, in anticipation, some of the exultation which larger resources than those of the United States would of course implant in the British heart. See how it discounts the future:

But the coal-fields of Pennsylvania—vast as they are—shrink into insignificance when compared with those of China. The coal-fields of the Celestial Empire cover an area of 400,000 square miles; about 33 times the extent of those British stores which have sufficed to make this country the workshop of the world. In the great province of Hunan, a coal-field extends over an area of 21,700 square miles. Hunan boasts of two distinct coal beds, one bearing bituminous coal, and the other anthracite—the latter being favorably situated for water transit, covering an area equal to that of the anthracite coal-fields of Pennsylvania, and yielding anthracite of the best quality. The province of Shansi possesses the enormous coal-area of 30,000 square miles. This is capable of supplying the whole world for thousands of years, even at the present rapid rate of consumption. The beds vary from twelve to thirty feet in thickness, while the system of coal-bearing strata in Shansi is about 500 feet in thickness, and has every facility for mining. An immense supply of iron ore adds to the mineral wealth of this great province.

But there is one consideration which underlies all this idea of a removal of British manufacturing interests bodily to some other country, to which we cannot assent. It is the fallacy, or what we look upon as a fallacy, of supposing that men can live in England whose interests are staked elsewhere. If British iron works are moved to distant countries, we think British proprietors will follow them, sooner or later. The day that serious decay attacks English industries, will mark a decline just as serious of national strength. That such a decline will come we do not anticipate with the certainty which we observe in some quarters; though in saying this we confine our outlook to the near future. Others who choose may speculate upon the events of a hundred years hence. For ourselves we do not think the circumstances require a prophet to look beyond his own generation.

As to what the present generation is likely to witness, we think the loss of the United States as a customer will be the most serious blow to English industry. That seems to us inevitable, for we look upon the United States as on the point of entering upon a manufacturing development which will exclude every competitor in its own markets. We have looked with patience upon the comparatively idle condition of our magnificent ore deposits, knowing that something more than ore goes to a blast furnace or a Bessemer steel works. But that "something" has been increasing with great rapidity in this country, and at the same time the agricultural population has been thickening until the producers of food are out of proportion to the consumers. Foreign writers would persuade us that agriculture is the peculiar business of Americans, but the truth is that agriculture and commerce are the two occupations which are overcrowded in this country. Metallurgy and similar manufactures offer inducements that are enhanced by the fact that they are still—in proportion to our wants—almost an open field.

The loss, then, of the United States trade, and a lessened demand from other European States, is what we think British iron workers have to expect in this generation. To offsett this there is the growing demand from British provinces in all parts of the world. These cling with filial affection to the mother country, and we think it will require more than a generation for other nations to first bring their cost of production below that in England and then raise up the commercial marine necessary to carry on trade in the teeth of their rival.

The Institute of Mining Engineers.

THE members of the Institute have returned home from their third annual meeting with an increased impression of the usefulness which marks these gatherings. It is impossible to carry out such enterprises without doing that which in business circles is always quoted as a sufficient proof of earnestness and sincerity—that is to say without "putting money" into them. These meetings are ttended by men many of whom can ill afford the time. Papers are read which epresent in most cases time and talent that would require a large fee if the duty were done for an employer, and not in a few cases considerable sums are spent n the unselfish effort to advance the profession and add to the sum of technical knowledge. The members who participated in the meeting just closed were the recipients of courtesies from the Reading Railroad, which were remarkable even among the long list of kindnesses extended to the Institute during its two years' existence. And yet that bounty so gracefully offered and so complete in its scope, was not an extravagant recognition of the labors which have made the Institute honorably known among the followers of technical pursuits.

The Institute on its part took occasion to recognize the services of two distinguished members of the mining profession. PETER VON TUNNER and L. GRUNER, names that require no preface to any one versed in the history of iron and steel making, were placed upon the list of honorary members, a list which is so carefully guarded that to be found in it is a mark of especial honor.

After the more formal requirements of the Session had been complied with the members addressed themselves to the task of combining pleasure with profit, and an excursion, comprising about thirty members, left Philadelphia at 1.30 P. M., Thursday, the 22d inst., by a special train from the Reading Railroad Depot, Thirteenth and Callowhill streets. At Reading, the Institute was received by Mr. J. E. WOOTTEN, General Superintendent of the road, who escorted the party through the extensive casting-house, and the machine and construction shops. The rolling mill, which has acquired such renown by the excellence of the rails which it produces, was next visited. Mr. W. E. C. COXE, the Superintendent of the Mill, to whom all the credit is due for its construction and efficiency, received the members and conducted them personally through the mill. The party then returned to the cars and continued the trip to Pottsville, arriving about 7 o'clock. The resident members of the Institute in Pottsville received their guests with the utmost cordiality, and attended to distributing them in comfortable quarters in the Pennsylvania Hall, and the Merchants' Hotel.

On Friday morning the members, strongly reinforced in numbers, left on special train at 7.30 A. M., for an extended trip among the collieries of Schuylkill County. The "Norwegian" shafts—well known to the members from Mr. E. B. COXE'S paper on the operations of the Diamond Drill in shaft sinking—were first visited. The pleasure and profit of this visit were greatly enhanced by the presence of the Engineer-in-Chief, General PLEASANTS, whose scientific ability is fully equalled by his genial courtesy.

On leaving the shafts, the party next visited in succession the Mahanoy Planes, Mahanoy City; Ellangowan Colliery, Preston Shaft No. 3, Tunnel Colliery at Ashland, and Mount Carmel Shaft at Alaska, returning to Pottsville by the Gordon Planes.

On Saturday the members again assembled at the depot at 7:30 A. M., and first visited the Middle Creek new shaft, and then the Brookside Colliery, working in the Lykens Valley seam. The trip concluded with a visit to the celebrated Iron Mountain at Cornwall. Here the party was received with the greatest courtesy by Mr. A. WILHELM, who, in the short time at his disposal, succeeded admirably in giving every one a general and clear idea of the nature of this wonderful deposit.

The excursion was, throughout, enjoyable in the extreme. The weather was, on the whole, propitious, and all the details of the trip were arranged and carried out with the most solicitous regard for the comfort, enjoyment, and safety of the party. It is with pleasure that the Institute acknowledges its obligations to the management of the Philadelphia & Reading R. R., and first to its honored President and its own associate, Mr. FRANKLIN B. GOWEN, for his thoughtful and liberal plan of the excursion.

Among those to whom the care of the excursion was entrusted, and who contributed so largely to its success, were: Mr. J. E. WOOTTEN, General Superintendent P. & R. R.R.; Mr. W. C. WHEELER, General Superintendent lateral roads south of Broad Mountain; Mr. J. H. OLHAUSEN, General Superintendent lateral roads north of Broad Mountain; Mr. H. W. TRACY, General Superintendent Schuylkill & Susquehanna Branch; Mr. A. HESSER, General Superintendent Mine Hill Branch; and Mr. S. W. FRESCOLN, the efficient special conductor of the excursion.

The National Association of Iron Manufacturers.

THE National Association of Iron Manufacturers had a meeting in Pittsburgh, on Thursday, May 15, at which the business interests of the members were discussed with closed doors. Some technical reports were made by Mr. DANKS, on his furnace; on a new rabble used by the Williams Catasauqua Manufacturing Company; and on a new lining for puddling furnaces, introduced by Messrs. ATKINS, MCINISH and BROOKS, at Youngstown, Ohio. It appears to us that, however necessary privacy may be in discussing details of their trade, it is rather childish to throw so much secrecy over matters of such publicity as reports of new inventions. The secretary made a report, a few items of which were given to the Pittsburgh *Commercial*.

The report says that the trade of the United States presents a rather anomalous condition, because, for the first time, we have caught foreign trade, while on account of the depression at home, we hardly recognize its influence. The Association was assured that the product of blast furnaces was very much smaller than was generally believed.

During a discussion the Secretary informed the meeting that a misapprehension existed as to there being an overstock of pig iron in the United States. The stock of both forge and foundry iron is light in the Lehigh Valley, and to-day No. 1 forge iron cannot be purchased at less than $40 per ton. In this statement the Secretary was borne out by a prominent manufacturer from the region mentioned.

A discussion occurred as to the mode of reporting the product and stock, and it was decided that hereafter quarterly instead of monthly reports be made. The expression of feeling was that, while the country was rather suffering from the stringency of the money market, the iron manufacturer was filled with hope for the future.

NEW PUBLICATIONS.

ELEMENTE DER GEOLOGIE. By DR. HERMANN CREDNER, *Professor at the University of Leipzig and Director of the Geological Survey of the Kingdom of Saxony.*

DR. CREDNER is well known, in this country as well as Europe, as one of the most enthusiastic, industrious, acute and judicious geologists of the present generation. Though still a young man, he has had advantages of training and of travel which amount, under his tireless use of them, to a long experience. He is the son of an eminent geologist and high official in the mining departments of Germany; and his early youth was devoted to the study of minerals and rock-formations, while a thorough education and considerable practice as a mining engineer has saved him from the dangers of excessive theorizing which so often beset the ambitious young scientist. He resided in the United States for several years; and we can personally bear witness to the prodigious activity which he displayed during that period, not only in the professional labors which occupied much of his time, but in spontaneous inquiry and study of the geology of the large portion of the country which he was fortunately able to explore. This activity bore fruit in numerous valuable papers upon American geology, some of which we have translated and published in the ENGINEERING AND MINING JOURNAL; and we were not surprised when the highest academical honors were conferred upon him, after his return, in recognition of his manifold contributions to science.

Only a man of extraordinary energy and industry could find time, among the duties of two responsible offices, to prepare a comprehensive and systematic treatise on the whole subject of geology. German professors are not famous for promptness in such matters, witness the slow appearance of *Lieferungen* and tantalizing instalments of great works, which get stale and have to be re-edited before the works are finished. We venture to believe that Dr. CREDNER'S American career has something to do with adding American vigor to the German thoroughness in his book.

CREDNER'S Geology appears at a time when a new summing-up of the current theories and the accumulated facts is likely to be as welcome as it is difficult to execute. In a cursory examination of it, we have been pleased to find that, though not without decided expressions of opinion, sometimes of an advanced type, it holds the balance fairly between opposing schools, and, in some points, is boldly conservative. The vexed question of metamorphism, for instance, is admirably treated. Adhering to the idea of a fiery-fluid terrestrial center, as the source of terrestrial heat and of volcanic phenomena, and admitting the undoubted agency of saline and thermal waters in the local metamorphosis of rocks, Dr. CREDNER enforces with much ability the view (held by HUNT and others) that the character of the oldest sedimentary (so-called metamorphic) strata is *original*—as much so as that of clay-slates or conglomerates. But the older theories on the subject are stated fairly.

The effect of modern philosophies is shown in the key-note of the work, which is the declaration that geology "is the science of the earth in its present appearance and its gradual development." The inquiry into this subject is divided under six heads, in logical succession. We translate the section in which the ground is laid out:

"What is the form, size and superficial configuration; what are the physical relations of the earth?' This is answered by *Physiographic Geology.*

"Of what materials does the part of the earth accessible to us consist? *Petrographic Geology* treats of this.

"What forces co-operated in the original formation and gradual alteration of the rock-materials and likewise the superficial features of the earth; and what are still active? Information is given by *Dynamic Geology.*

"In what way have the various rocks been formed, with the co-operation of these forces? *Petrogenetic Geology* concerns itself with this question.

"How have the rocks been disposed in the building of the earth; what is its architecture? These inquiries belong to *Architectonic Geology.*

"What is the history of the development of the earth and its inhabitants?—a question which *Historical Geology* seeks to answer."

At some future time, we may consider more at length the views of Dr. CREDNER under some of these heads. His excellent summary, peculiarly rich as it is in comparative statements of the geological records of different countries, will prove highly convenient to American students. We are glad to see that no attempt is made to teach the elements of palæontology. That cannot be well

done in a manual of geology, and the attempt results in superficial knowledge or utter ignorance. Students should be instructed in palæontology as a branch by itself, a general acquaintance with which is essential to the geologist.

This book, finally, is adorned with several hundred excellent wood-cuts—not the old set, which have figured in such works for a generation or two, but a new delivery, involving in many cases the use of American forms as typical. In the selection of these drawings, Dr. CREDNER'S old American note-book has doubtless assisted him by furnishing him with fresh, unhackneyed, and unquestionably accurate illustrations.

REPORT ON THE NORTH SEA CANAL OF HOLLAND; *and on the Improvement of Navigation from Rotterdam to the Sea; to the Chief of Engineers, United States Army*, by Brevet Major Gen. J. G. BARNARD, Colonel, Corps of Engineers, U. S. Army, Washington, 1872.

We are indebted to Gen. BARNARD for a copy of this handsome volume, printed in the quarto form peculiar to the professional papers of the Corps of Engineers. As a brief preface informs us, the author has been employed, with the sanction of the War Department, in examining personally, on behalf of the Tehuantepec Railway and Canal Co., some of the principal artificial water-ways of Europe. This account of the remarkable engineering works by which Rotterdam has been connected directly with the North Sea, is one of the fruits of that tour of observation. No better region for the study of canals than Holland could be found. As so often occurs, the practical experience of centuries has led the dyke builders of that country to results which accord exactly with the most advanced theories of engineers, and it is reported that one of our officers in examining the Dutch dykes found in constructions which were generations old, an evident obedience to the principles which have been developed in other countries only by the progress of mathematical investigation and the growth of scientific inquiry. General BARNARD'S work is worthy of the reputation he has gained by former labors, and is a valuable contribution to the engineering literature of the country.

CORRESPONDENCE.

The Stones of the Pyramids.

TO THE EDITOR:

SIR—I read with much interest in the last number of your Journal, the description and analyses of the mortar of the Great Pyramid, and thinking that some of your readers might be interested in the subject, I send you an analysis of the stone of which the Pyramids are built. I took the specimen from the Great Pyramid, and made the analysis in the laboratory of the Ecole Centrale, Paris.

Water	0.010
Carbonic acid, with traces of bitumen	0.410
Lime	0.503
Alumina, with traces of oxide of iron	0.035
Silica	0.030
Magnesia	0.012
	1.000

The analysis shows the stone of which the solid masonry (85 millions cub. ft.) of the Great Pyramid is chiefly built, to be a magnesian lime-stone; the blocks come from the compact dolomitic strata of the Masarah quarries in the Mokuttum hills, which lie across the valley of the Nile to the southward of Cairo. Some nummuitic limestone, quarried near the Pyramids, was also used in its construction. Granite was employed for the outer casing and part of the lower tiers of blocks.

The ancient Egyptians foresaw the great difficulty of producing a mortar capable of resisting the crumbling and splitting caused by the intense heat and sand-blasts of the desert, the action of which is analogous to that produced by intense cold, and is similarly destructive to masonry. This was probably the cause of the Egyptians reducing the part which mortar was to play in their edifices to as small a degree as possible, and the joints are very narrow and few in number in all their constructions.

In a country where rains are infrequent, but the heat intense, calcined gypsum made into a mortar will resist well the action of the weather, and the proportion of lime in the gypsum mortar of the Pyramids doubtless adds to its strength, in the same way as it does to the celebrated Plaster of Paris.

Respectfully yours,

LEONARD F. BECKWITH, C. E.

The Brown Coals of the Western Territories Improperly Called Lignites.

[The following correspondence, though private, discusses a point of public interest and of considerable importance, which is our excuse for producing it here.]—ED.

R. W. RAYMOND, Ph. D.:

MY DEAR SIR—I have read with great satisfaction your paper on "The Calorific Power of Western Lignites," in the "Journal" of May 27. It is an important contribution to our knowledge of a subject on which definite results were much needed.

You will, I hope, pardon me if I take this occasion to suggest to you, and to mining engineers and geologists generally, that we should call the brown coals of our great western territories by their true name. They are BROWN COAL—true coals as were ever seen and not as we have allowed ourselves to call them, *lignites*. The old sense of this term ought to be retained or restored to our scientific nomenclature. The true meaning of the term lignite is the old one of a body retaining the form of the woody trunk of trees and burning with an empyreumatic and often a pyroligneous odor; in fact an imperfectly coaled wood. Brown coal is the term preferred by DANA, both in his mineralogy and his geology, and discussing the subject with him over your paper, we agreed to ask you to change the title in our journal (where we propose to reproduce it with your permission) to read "On the Calorific Value of the Brown Coals of Western North America."

We must remember that the true geological age of these Brown Coals is yet in doubt. The geologists and paleontologists wish to place them in the cretaceous, the fossil botanists alone remand them to the Tertiary, and the weight of opinion is undoubtedly with the geologists.

Now that your calculation of their calorific value places them so well up in the scale of temperature, is it not a good time to reclaim these beautiful products from the dingy and half-formed dominion of lignites, and place them where they belong, as true coals in every sense, chemical and physical? Our German friends always call them *Braunkohle;* and I think we have insensibly slid into the habit of calling them lignites from the French. The term lignite fails to convey a proper sense of the high value of this beautiful fuel, which is to play so important a part hereafter in our metallurgical history and internal industry.

NEW HAVEN, May 26, 1871. Yours truly, B. SILLIMAN.

REPLY.

PROF. B. SILLIMAN, New Haven, Conn:

DEAR SIR—In reply to your favor of yesterday, I must say, too briefly for proper discussion or due courtesy, to Prof. DANA and to you, that while I have no objection to the change you desire to make in the title of my paper, I honestly think you gain nothing by it. In my opinion, *Braunkohle* and *Lignite* are either exactly synonymous, or else the former term is decidedly the more depreciative as to the quality of the fuel. The ordinary usage in Germany is to make them synonymous; but if any distinction is made, it is this: *Braunkohle* is based on the inferior appearance of the fuel, and *Lignite* on its woody (as distinguished from other vegetable) origin. You are aware that most of the German *Braunkohle* answers exactly to your description of lignite. The *Pechkohle*, or pitch-coal, is the variety which answers to our best Western lignites. So the change you suggest does not rid you of the evil odor, pyroligneous or financial, which attaches to the ordinary "cheap and nasty" fuels of this class.

BURAT, in one passage, (*Géologie pratique*, ed. 1870, p. 302) seems to make a distinction between the two terms. He says:

"The tertiary lignites rarely possess the exceptional quality of the lignite of Fuveau, called *lignite parfait*, because *it has preserved in its structure no trace of its woody origin.* In many cases the tertiary lignites have preserved the texture and constitute in some sort accumulations of fossil woods. These *débris*, generally mixed with clay, are exploited for local consumption only; hence the lignites proper have very little importance in France. In Germany their extraction is considerable, because they are at once more abundant and more pure. Thus Prussia raises four million tons *of these woody lignites, called Braunkohle.*"

I have italicized the clauses in this paragraph which tend to confirm my notion that the lignites of Germany are *Braunkohle*, while those of Western North America are strictly not so. The difference appears very slender; and I do no care to insist upon it; but whatever there is of it strikes me as being against your suggestion. The advantage of the presence of the word *coal* in the title you propose vanishes when you consider that Utah quaking-asp charcoal claims a similar dignity, and behaves no better for having it.

NEW YORK, May 28, 1873. Yours truly, R. W. RAYMOND.

ENGLISH CORRESPONDENCE.

EDITORS ENGINEERING AND MINING JOURNAL: LONDON, May 6th, 1873.

The third session of the Iron and Steel Institute was held on Thursday, May 1st, and was commenced by the reading of a paper by Mr. T. R. CRAMPTON, on the combustion of powdered fuel in revolving furnaces. In this furnace the coal is ground and conveyed by the ordinary flour mill apparatus at a cost of about 1s. (English) per ton, and fed from the hopper through adjustable rollers into an air injector, and introduced into the furnace mixed with air. The feeding apparatus was a great difficulty, the requirements of such a machine being regular action whether the coal be wet or dry. It was ascertained that from the intense heat produced, and other causes, there was rapid wear and tear of the brickwork, but observed that where a natural slag was formed the bricks were protected. The object then was to endeavor to consume so much as possible in contact with such slag, conducting the unconsumed products over the material to be treated without striking the brickwork. Under these conditions the combustion was so perfect that cold scrap iron was welded with 5 to 6 cwt. of coal per ton of iron, and this with cold air and without utilizing the heat in the chimney. In other cases, steel of the ordinary kind was melted in 1¼ hours, and in other instances 60 lb. of *pure* wrought iron was melted in 3½ hours, a sample of which was shown. "This," he believed, "had never previously been accomplished by cold air and coal. It is an evidence of the extraordinary perfection of the combustion, since the theoretical heat producible is only in small excess of the melting point of wrought iron, and, had any variation in the quantities of air and coal occurred, such a result would be impossible." Other experiments were made with a large marine boiler by taking out the fire-bars and lining the furnace with brick-work. The boiler contained 1,500 square feet of heating surface. In a 24 hours trial the variation of temperature in the smoke box did not vary 20 degrees Fahrenheit,

that is between 380 and 400 degrees. There was found no difficulty in evaporating 10 to 11 lb. of water per lb. of coal.

Mr. CRAMPTON made no allusion to the furnace of Messrs. WHELPLEY & STOBER, which I believe, they make similar claims for, at least as far as the use of waste coal and economy is concerned. Mr. CRAMPTON's paper elicited considerable discussion, in the course of which the Danks puddler was brought in for some severe criticisms.

Mr. WILLIAMS, of Messrs. BOLCKOW & VAUGHN, was especially severe, claiming that the repairs were so great and frequent, that iron men must be precluded from substituting the puddlers for the existing puddling furnaces, although he did grant that better iron was produced.

Messrs. BELL, COWPER, SPENCER & SNELUS answered in favor of the Danks machine.

Mr. MAYNARD cited the excellent work being done at Chattanooga, where there are 10 of the machines in active and constant use.

The second paper was on a new method of preventing shock in reversing rolling mills, by Mr. JEREMIAH HEAD, Middlesbrough. Two years since, the attention of the Institute was first called to the serious evils attending the shock arising from the use of clutches in reversing rolling mills, by Mr. BENJAMIN WALKER, of Leeds. In the course of his paper, Mr. WALKER made the following remarks:—

"Several suggestions had been made for removing this sudden shock or blow; but the only instance that he knew of actual application, was a plan designed by Mr. CHARLES BLADEN, and applied to some new mills then in course of erection at Jarrow. His plan was to mount the claws of the clutch in such a manner, that when the running claws came in contact with those at rest, they would slightly give way, and thus reduce the shock, just as the buffers of a wagon give way on coming in contact with another wagon with similar buffers. *While the contrivance lasted, it answered the purpose thoroughly;* but from its faulty construction it had to be removed."

Mr. WALKER proceeded to describe the systems of reversing adopted by Mr. J. RAMSBOTTOM, at Crewe; Mr. F. KITSON, at Leeds; and his own firm, at Blochairn. At the Glasgow meeting of the Institute, the inventions of Messrs. R. D. NAPIER, and G. STEVENSON, were thoroughly discussed.

In introducing a new method, founded upon Mr. BLADEN's original idea, Mr. HEAD disclaimed any intention of competing with the before-named inventors, the merits of whose various methods, he cordially acknowledged. He invited attention to his, merely as an alternative scheme, applicable in cases where the other expedients would be inadmissable, and especially where it was desirable to improve existing old-fashioned reversing gears with minimum loss of time and expense.

Mr. RAMSBOTTOM's system required a complete revolution of engines and gearing. Messrs. NAPIER and STEVENSON both required a minimum distance between the loose spur wheels of 5 feet for the introduction of the necessary apparatus. In many existing gears there was not more than 3 feet available for the purpose, and this was sufficient for the method he would explain. It consisted of the introduction of a loose face, between each loose wheel and the clutch. These loose faces are bored out to the same diameter, and are carried on the same portion of the loose axle as the spur wheels, with which they are in contact. Cast in them are recesses, corresponding to, and engaging with, the claws of the sliding clutch, instead of these claws being made to engage as heretofore, with recesses or claws upon the inner faces of the loose spur wheels themselves. Each loose face is made in two halves, firmly bolted together, so that one or both halves may be readily removed and replaced when necessary. Cast in the back of each half of each loose face, is a recess or pocket, into which is firmly secured an arm or lever, composed of bars of spring steel. The extremity of each spring arm is held in a socket attached to the inside face of the loose spur wheel in contact with it. In the act of reversing, the clutch is thrown to one or to the other side in order to communicate to the shaft upon which it slides, the motion of either of the loose spur wheels with which it engages, and which, by means of the wheel work behind them, are permanently rotating at a constant speed, in opposite directions. Precisely the same takes place under the improved system, except that the loose shaft acquires motion, not direct from claws solid with the rotating spur wheel, but only as the force in the rim thereof can be transmitted to it through the two spring arms attached to the loose face. These spring arms yield, to a certain extent, just as does the spring drag hook of a locomotive when it suddenly endeavors to start a heavy train. Should the spring arms have failed to impart their motion to the sliding clutch and loose axle, after having yielded as much as they are capable off (about 1-40th of a revolution), then certain projections upon the loose face would come in contact with safety claws secured to the arms of the loose wheels.

This prevents all danger which might arise from breakage of the spring arms, or from their being drawn out at their extremities. The maximum force, which the author had ever found requisite for rolling a single plate, was 17 tons in the engine piston, moving at the rate of 272 feet per minute, equal to 7½ tons exerted at the extremities of the two spring arms, or 3¾ tons upon each. The spring arms, composed each of 44 plates, 3½ inches by 5-16, are sufficiently strong to bear this load safely.

This, and Mr. NAPIER's new method of reversing, are the only modern ones admitting of being operated by an ordinary lever worked by manual power, that is, without the intervention of steam or hydraulic apparatus.

The cost of two loose faces, each with a pair of spring arms, and all the necessary brackets, safety claws, bolts, and wrought ironwork necessary for application to an ordinary reversing gear, is about £129 10s.

If the loose faces were of cast steel or wrought iron they would cost more in proportion.

The author concluded by saying he had not patented his invention, and would freely and willingly give any further information which any member might desire. The paper was illustrated by two diagrams, and a highly finished working model.

Messrs. SNELUS and JONES, who had seen the working of the three high rolls in America, took the ground that all the expensive and complicated plans for reversing used in this country, were rendered unnecessary by the American system.

Theory of the Bessemer Process.

IN opposition to the deductions which KUPELWEISER and SNELUS have drawn from their chemical analyses, KESSLER finds that in the Bessemer process of steel making the entire amount of carbon present (owing to the oxidation of the other substances being, in the commencement of the "blow," more energetic) increases relatively, as in puddling, and that the carbon first begins to oxidize after the major part of the silicon has disappeared. The amount of phosphorus in the steel decreases in the middle stage of the process, but increases both in the commencement of the "blow"—owing to the relative greater oxidation of the other substances—as well as at the end, when it is, in part at least, taken up again from the slag. Sulphur decreases rapidly at first, but then increases in the middle stage, up to the addition of the spiegeleisen, for the reason that a portion of it, which in the first stage went into the slag in the form of metallic sulphides, was afterwards again taken up by the iron. So long as the manganese is being oxidized and removed from the iron, the percentage of sulphur in the iron diminishes; but as soon as the iron is free from manganese, it again takes up a portion of the sulphur contained in the slag. When the spiegeleisen is added, and the "blow" recommenced, the sulphur again diminishes; and if the first slag (which is sulphurous) could be removed, then it would be possible to use brands of iron which are known to contain sulphur for making Bessemer steel. —*Journal of the Iron and Steel Institute.*

Fresenius and his Laboratory.

BY J. S. UNZICKER, M. D.

MR. R. FRESENIUS, although 54 years of age, is yet in his prime of life, as regards mental and physical activity. Being one of those few hard workers and original thinkers, he has accomplished much for science and mankind generally. Of his great reputation as a chemist I need not speak—that is well known to all men of science. But as a man, also, no one stands higher in the community, nor more respected by all who know him, than he does, for his urbanity and universal kindness toward all who may come in contact with him.

It is not in chemistry alone that he has built up a great reputation, but he has also rendered great services in natural science, public education, agriculture, and manufacturing. All of which he has been, and is still, aiding by his extensive knowledge and labors. In acknowledgment of this, the Government has conferred upon him the title of "Privy Councillor of Court."

LABORATORY.

This is a private institution assisted by the State, but owned and under the entire supervision of Dr. Fresenius. It is located on "Capell Strasse," in Wiesbaden. The building is 120 feet front, overlooking the city, with a fine view of the Taunus mountains in the distance.

The laboratory includes three distinct departments:

1. Qualitative analysis. 2. Quantitative analysis. 3. Manufacturing.

Students entering the institution commence work in the qualitative laboratory, which is a room 24 by 45 feet, well lighted, and accommodating thirty-three students. The room is furnished with a set of Bunsen's filtering pumps, glass blowers, lamps for fusions, and apparatus for keeping up a constant supply of distilled water. By means of large wooden hoods, shut off from the laboratory by glass sashes, all noxious vapors are conducted off. Each student has his work table, also a closet with lock and key attached thereto. The course of work consists in the analysis of 100 different substances of unknown composition. Fresenius visits his students daily, and always expects a detailed account of the work of each: and where a difficulty arises, lays great stress on the importance of every reaction being tried for itself. The quantitative analysis is conducted in a room 24 by 40 feet, having tables for nineteen students, and is fitted with all the necessary apparatus like the first. In this, as well as in the former room, two assistants representing Fresenius are constantly occupied. The quantitative assaying room, accommodating six students, is furnished with a cupel and assay furnaces, &c. HS, as a re-agent, is employed only in the open air, for which purpose an apparatus yielding a constant supply and covered by a hood, is convenient to each room. The balance-room, containing nine chemical balances, is situated between the two quantitative rooms, and is carefully heated to a constant temperature. The course of work in the quantitative department consists in the analysis of about fifty different minerals; alkalies, ores, paints, dye-stuffs, coal, soap, and manure; fire assays and elementary analysis of sugar, starch, gum, gas analysis, &c. All quick and practical methods for purely technical purposes are here most thoroughly worked out, and students can fit themselves to become at once chemists in all branches of manufacture.

In the manufacturing department, the chemical re-agents used in the Institution are made in a state of almost absolute purity by an experienced assistant of Fresenius. In the furnace-room you will find sand-baths and retorts for the purification of acids, etc. Here instruction is given in special branches of manufacture, as of aniline colors, crystallized salts, etc. The library-room contains a complete selection of all standard works and journals relating to chemistry and all branches connected therewith, where students can retire for consultation. The store-room contains a complete selection of chemical apparatus, where students can supply themselves at low rates. There are also two lecture-rooms; a private test-room, with analytical balances and other apparatus, to prove the correctness of important analyses. Next comes the private laboratory, library, study, and reception rooms of Fresenius. The best students, after completing their studies, are generally allowed to become private assistants to Fresenius in his own laboratory. These positions are much sought after, yielding no pay, but affording the greatest opportunities for more perfect and practical experience. Students have to provide themselves with all the small utensils and apparatus necessary, but all large ones are loaned to them by the Institution. The pharmaceutical department connected with the Institution is also assisted by the State. The summer semester (course) begins April 24th, and continues four months. The winter semester begins October 15th, and continues four and a half months. The charges are very moderate, being only, for a full laboratory course of one semester, £7 7s. It is, however, optional with students to work as many days in the

laboratory as they please, for which proper deduction is made. This arrangement or declaration must be made at the beginning of the session.

The honorary fees for the lectures of the Institution are as follows:

	£	s.	d.
Experimental chemistry, first division	1	5	6
" second division	1	5	6
Organic chemistry	1	5	6
Special theoretic chemistry	0	13	9
Experimental physics, first division	0	17	9
" second division	0	17	9
Botany, first division	0	17	9
" second division	0	17	9
Zoology	0	17	9
Mineralogy	0	17	9
Pharmaceutical chemistry	1	1	0
Pharmacognosy	1	1	0
Repetitorium on pharmacy	0	10	3
Chemical technology, inorganic division	0	13	9
" organic division	0	13	9

By this it will be seen that this Institution offers advantages not easily found elsewhere. Manufacturers and advanced chemists, who wish to perfect themselves practically in some special branches, will find no better opportunities than here, under so renowned a teacher, who is master of his art. Wiesbaden is one of the most charming places to live in, and as the surrounding country offers great advantages for the study of botany, weekly excursions are made by the Professor of Botany during the summer semester, giving a chance to each student to pursue his studies practically and collect a nice herbarium for himself.

May this good Institution long continue in its present flourishing condition, and may the young chemists issuing therefrom never forget their "alma mater," and in their future professional lives try and imitate their great teacher.—*Chemical News.*

MINING SUMMARY.

Large Mining Dividends.

We copy the following interesting article from the *Mining and Scientific Press* of May 10;

People who doubt the permanence and richness of the Comstock lode, and who revile against mining operations on general principles, will doubtless be surprised at the dividends paid by the companies on this lode this month. The Crown Point mine has declared a dividend of $10 per share aggregating $1,000,000, the largest dividend ever paid by a mining company in one month on this coast, or elsewhere, as far as we know. The Belcher's dividend of $8 per share, aggregating $832,000, is the next largest ever paid, both together amounting to $1,832,000 from these two mines for one month. The Eureka mine has declared a dividend of $2 per share, equal to $40,000, and the Consolidated Amador will probably pay $1 per share, or $30,000, which will aggregate $1,850,000 for one month. The dividend of the Crown Point mine is just double what it was in April, when $5 per share was declared, aggregating $500,000, which, added to that of the Belcher for April, amounted $1,020,000. Moreover, the surplus of the Belcher for April was $200,000, which added to the surplus on hand, makes about $1,000,000 carried over to be added to the production for the current month.

As showing the relative increase in the amount of dividends disbursed by the companies, the following figures are interesting. During the year, 1872, the amount disbursed in this manner by mining companies called on our Stock Board was $6,731,100; in 1871 the mining dividends were altogether only $4,837,850, showing an increase of $1,893,150. This increase occurred, notwithstanding a number of prominent companies which paid dividends in 1871, paid none in 1872. They were the Amador, Eureka Consolidated, Redington Quicksilver, Sierra Nevada, Succor, and Yellow Jacket. The sum paid in 1872 was by the following companies:

Belcher	$2,184,000
Cederberg	36,000
Cho'lar-Potosi	56,000
Crown Point	1,860,000
Eureka	40,000
Keystone Quartz	30,000
Mahogany	15,000
Meadow Valley	360,000
North Star	27,000
Pioche	40,000
Providence	3,1000
Raymond & Ely	2,070,000
Yule Gravel	10,000
Total	$6,731,100

The dividends thus far this year are as follows:

COMPANIES.	AMOUNT.
Belcher	$2,490,000
Crown Point	2,100,000
Consolidated Amador	120,000
Cederberg	24,000
Diana	1,181
Eureka	120,000
Meadow Valley	60,000
Monitor-Belmont	50 000
Raymond & Ely	300,000
Total	$5,265,181

These dividends were paid irregularly. The Diana and Meadow Valley paid one each, the Monitor-Belmont, and Raymond & Ely two, and the others three each up to this month. This is exclusive of coal mining companies, our figures having to do only with gold and silver. Besides these, the Idaho mine, at Grass Valley, not called in our Stock List, has just paid $20 per share, not taken into account.

From these figures will be seen the great increase in amount of mining dividends this year. The amount for the first five months of 1873—some dividends for May not yet having been declared, moreover—*exceeds the total dividends of* 1871 by $427,231. The dividends thus far in 1873 being $5,265,181, and that of the total for 1871 being $4,837,950, leaving a difference in favor of these first five months of $427,231.

It must be remembered, however, that these figures only represent the dividends of those mines dealt in at our Stock Board, a point always to be borne in mind. Thousands of mines scattered over the Pacific Coast pay out large sums to their owners of which the public hear nothing. Some of our heavy mining capitalists own these mines alone, or associated with one or two others, and as only private reports are made, the figures are not made public. We know of a number of such instances. The hydraulic claims of our own State, owned by a few hard-working men, pay large sums monthly, which do not find their way into the statistics. An example of this is shown in an item in another column, where it will be seen that the Spring Valley Canal and Mining Company at Cherokee Flat, Cal., turned out $50,000 in gold in April. Consequently people should not say, "mining does not pay," because they see in the papers that during 1872 only $6,731,100 was paid out as dividends, while the bullion production was $62 236,914. This money not only went into business channels, but supported many thousand men and made fortunes for thousands more.

Oregon.

"BLACK SAND" MINES.

From the *Mining and Scientific Press* of May 10.

Considerable interest has been manifested by the public of late with regard to the gold sands on the Oregon Coast, and several expeditions have been organized for the purpose of raising these sands from the bottom of the ocean, and obtaining the gold which is supposed to have collected in large quantities. The impression prevails to a certain extent that the existence of these sands is confined to the ocean beach, but such is not the case. A number of claims are located within a few miles of the ocean which have been worked for several years. The surface of the country for some little distance back from the ocean is comprised of low rolling hills of sand and gravel, covered with a thin soil. These hills follow the line of the coast in the form of bluffs. On the beach at the foot of the bluffs very rich sand has been found and in years past large amounts of money have been extracted. As it is probable that the waves washed away these bluffs, in the course of time, they have performed a sort of hydraulic process on a gigantic scale and left the heavy particles of gold on the beach. The supposition is that outside the line of surf this fine gold has collected in large quantities in pockets or crevices in the rock. The existence of these beaches so far back from the coast and the fact that the waves would naturally throw up the lightest instead of the heavier particles, is sufficient evidence to overthrow the old theory, that these sands were thrown up by the action of the waves from the bottom of the ocean.

It will probably be interesting to our readers to learn something of the manner in which these "blacksand" claims are worked, that is, those which are situated not on the present beach, but back in the timbered country several miles from the beach proper. The deposits generally lie parallel to the present beach and are buried under from 50 to 75 feet of common white sand. The great difficulty in making these claims profitable has been from the reason that the gold is very difficult to save. In the first place it is extremely fine and light, and the difference of specific gravity between it and the black sand, containing a large proportion of magnetic iron, with which it is associated, is so little that separation by ordinary means is inconvenient. Moreover, the gold is coated with some foreign substance which prevents its amalgamation with quicksilver. This is thought by some to be chiefly organic matter, perhaps of bituminous oils, and by others simply oxide of iron. At all events this peculiarity is a disadvantage to making the claims profitable, as so much is lost.

Colonel LANE, one of the proprietors of the "Pioneer Black Sand Mine," near Randolph, Coose County, Oregon, was in this city this week purchasing improved appliances for working the sand, and he has furnished us with some interesting information concerning the method of working. The deposit upon which this claim is located is about 350 feet wide, and lies parallel to the present beach, with an average depth of six feet. The deposit is covered with about sixty feet of white sand, on top of which is a growth of timber. The deposit extends, to Col. LANE's knowledge, about three miles, and lies about two miles from the present ocean beach. This mine has up to this time been worked in the old-fashioned way, with sluices, copper plates, riffles, blankets, and the usual gold-saving apparatus. In this rude manner of working they have managed to save only about one-tenth of what was in the sand, but even then they have done pretty well with the claim. They have saved about $2.50 per ton at an expense of 50 cents per ton. Difficulty is experienced in opening these mines from the water, and they require to be drained before much can be accomplished. In order to work it, deep cuts are sluiced through down to the bed-rock, and then tunnels are run, and the heavy sand which contains the gold is brought out in cars to the sluices. The lagging in the tunnels is set very close, and where the water is very bad, moss is caulked into the cracks. The top and sides being of sand, of course great care must be taken in timbering. To get water to this claim a ditch and fluming, six miles long, was made, and in opening a tail race to the ocean from the claim a large cut had to be made through the rolling hills from forty to eighty feet deep, a length of two miles. There is only about 175 feet fall from the bed-rock in the claim to the beach. In cutting this tail-race it was necessary to cut through a large deep lagoon, which was a very difficult operation, an immense amount of labor being expended on this alone. Although there is plenty of water in the winter, in the summer it is scarce, as all the soil thereabout is sandy and will not hold it. For this reason all the sluicing off of the top dirt is done in the winter, though there is water enough for working purposes on a small scale in summer. The character of the ground upon which these claims are located is described at length in a paper read before the California Academy of Sciences by W. A. GOODYEAR, of the State Geological Survey, and published in the *Mining and Scientific Press* of December 14th, 1872. In the claim mentioned, at this time of the year they have about fifty inches of water, but only twenty feet fall. However, a powerful head of water is not needed for this sand, as would be the case in regular hydraulic diggings.

As mentioned previously, great trouble is experienced in working these sands to a profit, and Col. LANE and others have tried innumerable experiments to obviate this difficulty, and devise some plan to work them economically and carefully. In some claims in that region the chlorination process is employed with good results as far as working is concerned, but the expenses almost eat up the profits. They have tried working it in ordinary pans, but the black sand and gold combined, is so heavy that the quicksilver "flours" very badly, and the results were not satisfactory. In some cases the sands have been burned before amalgamating, in order to free the gold of the covering of extraneous matter. This of course entails additional expense. As a result of some recent experiments at the "Pioneer" claim new machinery has been constructed in this city, which will shortly be put up at the mine. As soon as any practical results are accomplished in working the sands economically, we will give a description of the process employed; until such time it is hardly worth while for us to go into detail.

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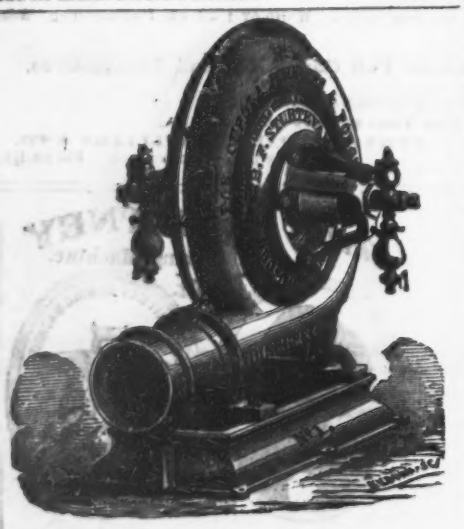

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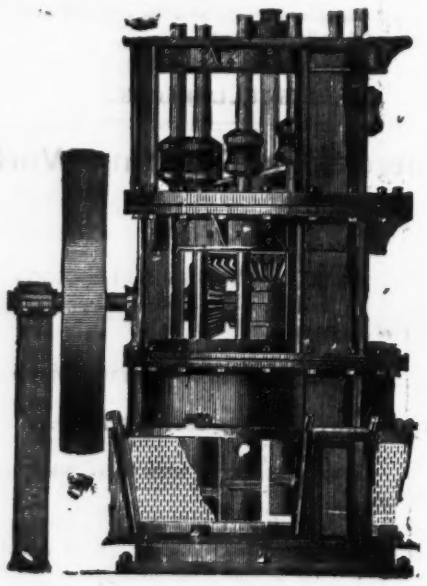

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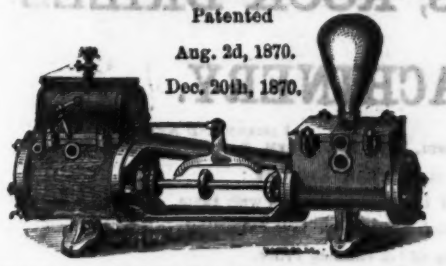

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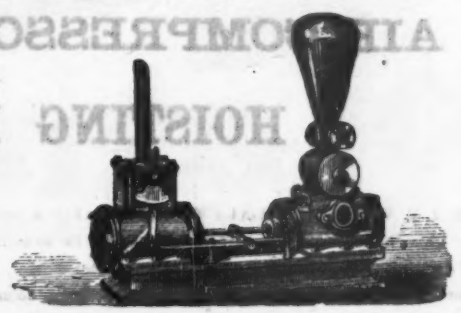

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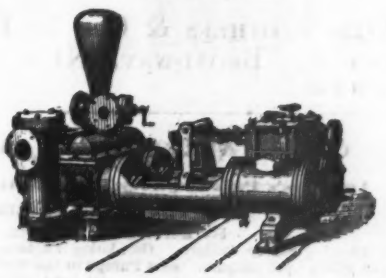

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